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CONTENTS

Gardens For The Blind. CAROLINE B. STRONG.....	63
Charming But Forgotten Plants. ERIK HANS KRAUSE.....	66
The Lily. E. BUCKNER KIRK.....	67
The Bottlebrushes Like Wet Feet. EDWIN A. MENNINGER.....	77
Seed Germination. R. MILTON CARLETON.....	83
The Oregon Coast In Bloom. PHILIP M. POST.....	87
Recent Advances In Horticulture. FREEMAN A. WEISS.....	90
Daffodil Breeding In South Carolina. MRS. BEN B. ROBERTSON.....	93
Kniphofia For Your Garden. PEGGIE SCHULZ.....	99
Cover Illustration.....	100
A Book Or Two.....	101
The Gardeners' Pocketbook:	
The Fundamentals Of Pruning.....	107
<i>Columnae crassifolia</i>	109
A New Upright <i>Carpinus caroliniana</i>	111
<i>Acacia farnesiana</i>	112
<i>Erythrina herbacea</i>	112
<i>Lotus mascaensis</i>	113
Dutch Iris.....	113
Floribunda Rose 'Circus'.....	115
Coleman's Native Azalea Trail.....	116
The Use Of Simple Outdoor Frames In Rooting Of Summer Cuttings.....	118

The National Horticultural Magazine

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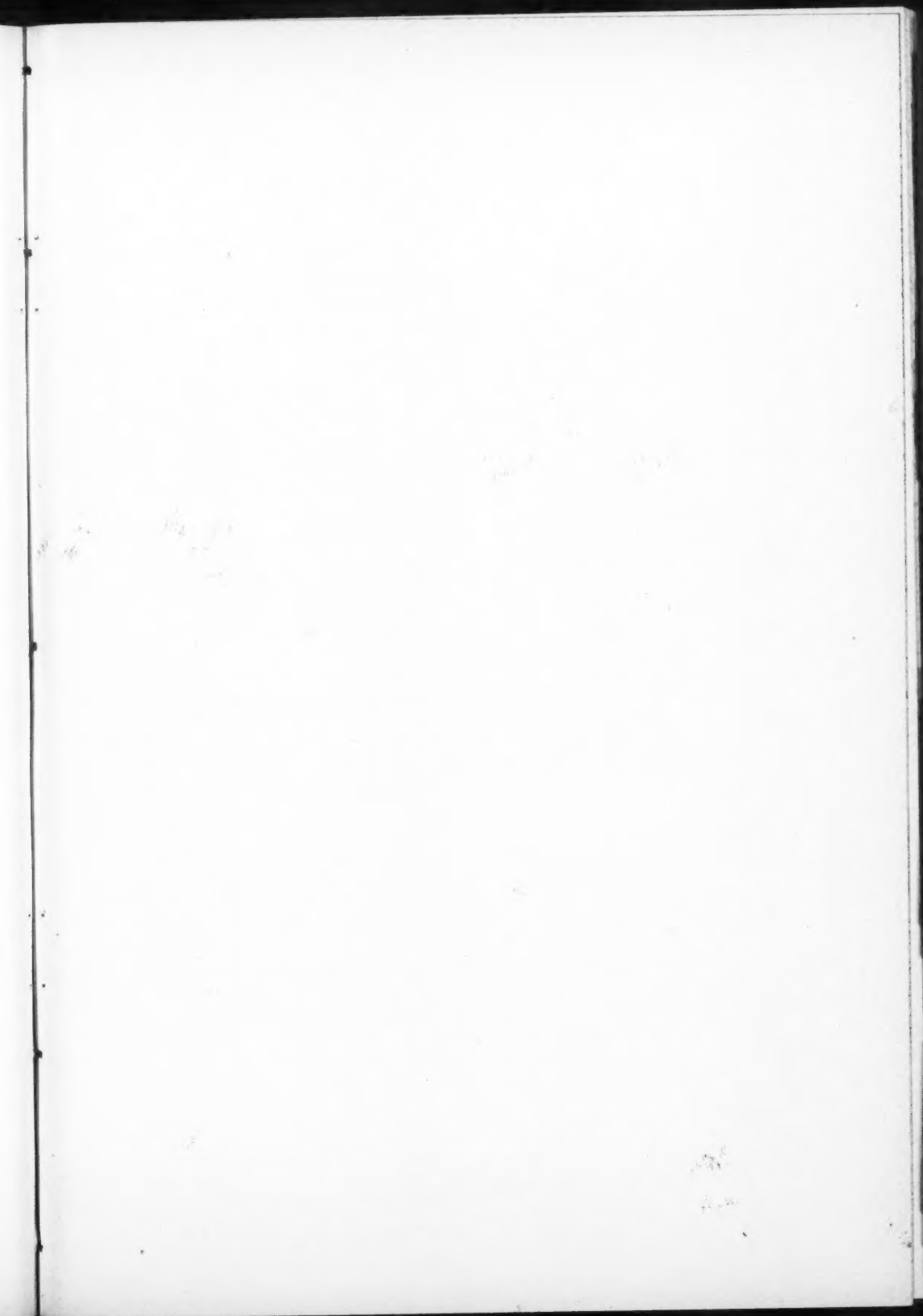
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Gardens For The Blind

CAROLINE B. STRONG¹

The first garden in the United States to be planted for the blind is at the John J. Tyler Arboretum at Lima, Pennsylvania, outside of Philadelphia. The garden was started in 1949 by the then superintendent, Mr. Charles G. Whittaker, who had read of a public park in Exeter, England, in which there was such a garden. The directors of the Tyler Arboretum approved the idea and agreed to donate a site, should outside interest and the essential outside financial help warrant.

Interest in the project was immediately forthcoming from State and County Associations and Commissions for the Blind, and help in the actual construction of the walls and terraces was volunteered by the Media Lions Club, as well as other Lions organizations, Kiwanis and Rotary Clubs. Several garden clubs in the area offered assistance with the planting of the proposed borders, notably the Providence, the Hill and Hollow, and West Chester Garden Clubs which have had a continuing interest. The Philadelphia Unit of the Herb Society of America donated the plants for the Herb Border and continues to maintain it. There were also individual contributions of

cash and/or labor from interested friends in the community.

The site for the garden was chosen with the topographical requirements for such a garden in mind: a sloping southern hillside, so that the various borders could be planted at waist height, an important feature in that the blind visitors must be able to reach the plants without difficulty. The site had the further advantage of being near the entrance to the Arboretum, thus readily accessible to the parking area, and, in addition to the beautiful old trees that surround it, it had a superb 150-year-old stone barn as backdrop.

The plan of the garden resulted from a combination of sketches, blueprints, and a drawing by Natalie Davis, New York artist, who illustrated her conception of the layout. It consists of a series of wide, terraced borders, approximately sixty-five feet long, providing space for herbaceous plants along the edge and backed by flowering shrubs, the total width of each planting level about six to eight feet. Below each flower border is a retaining wall with low curbing at the bottom as a foot guide for the blind. This prevents barked shins against the walls, and also protects the trailing wall and rock gar-

¹Philadelphia Unit of the Herb Society of America.

den plants. The grass path along each border is somewhat narrower than might be expected, but this is to make the handrail on the other side of the path within easy reach. Thus the blind visitor safely progresses through the garden, with foot-guide, wall, and waist-high border on one side, and handrail and the flowering shrubs of the next lower terrace on the other. The handrail connects the descending terraces and returns the visitors up the outside slope to the roadway. Gates at each end, normally open, are closed when blind visitors enter so that they may have a continuous handrail trail.

The first wall is planted to early spring bulbs and early fragrant herbaceous plants, and in summer to fragrant annuals and such plants as rose geranium, heliotrope, lemon verbena, etc. The herb planting is on the top of the second wall and contains thirty-six varieties of herbs, culinary, medicinal and sweet-scented. The third wall is planted with herbaceous plants flowering from mid-May on, and includes iris, peonies, hemerocallis, phlox, chrysanthemums, etc. Braille labels mark all these plants, and it is hoped to add key numbers to these labels so that visitors may find full botanical details of each plant in a Braille Master Guide.

The planting of these borders has been most interesting, particularly the herb border, for, although the Braille markers provide the identifying information, nevertheless, an effort was made to separate plants of similar texture, fragrance or flavor, in order to simplify recognition. Obviously the visual importance of appearance, balance and color was made secondary to distinct differences in size, habit of growth, texture and scent. Space being limited, it was impossible to make any of the borders a complete collection, and, of course, briars, thorns and rank growers had to be eliminated, but with fragrance the first consideration, and

hardiness and ease of maintenance the next, certainly a most charming and attractive garden resulted.

The garden was formally opened and the bronze plaque listing the donating organizations was installed May 22, 1954. On that occasion, it was gratifying to hear the enthusiastic accounts of visits, and the appraisal of the value of the garden as a whole, from some of the officers and teachers of the Overbrook School for the Blind. The most frequent visitors have been groups from this school, whose outings have always been enjoyed by teachers and pupils alike, and are now invaluable for Nature Study. One teacher said that a garden of this sort was by far the best way, if indeed not the only way, to really teach botany to blind children, since verbal descriptions, dried, cut or greenhouse material make poor substitutes for whole borders of living, growing plants.

Interest in this garden has been amazingly widespread, and visitors from distant states, some even from abroad, have somehow heard of it and have been coming to see it ever since it was first started. Its usefulness as a Demonstration Garden for the Blind has already been proved, and, although its distance from the city is a handicap to its more frequent use by the adult blind, it is hoped that this problem, mainly one of transportation, may be surmounted soon.

The garden is always open to the public, as is the Arboretum which surrounds it. This rolling tract of land, some six hundred acres of forest and meadow, intact since 1701, contains one of the richest and rarest collections of trees and shrubs in this vicinity. The collected material, planted between 1825 and 1870, has now attained a size and maturity that could not be matched in a more modern botanical garden. The beautiful setting and surroundings, mercifully untouched by highway or

bulldozer, still breathe the "freshness of the far beginning" and are a heritage and a trust that must be seen to be appreciated. It is not necessary to make appointments, but, should groups or individuals wish to do so, they may write to Raymond Ouillet, Tyler Arboretum, Lima, Pennsylvania, or telephone him at Media 6-3113.

The Herb Society of America has taken a particular interest in Gardens for the Blind, for certainly herbs, through the fascinating romance of their history, uses, and lore, lend themselves exceptionally well to such purposes. Their scents and flavors, whether aromatic or sweet, are distinctive, and the plants have a rugged quality which permits them to be handled, tasted, or tread upon.

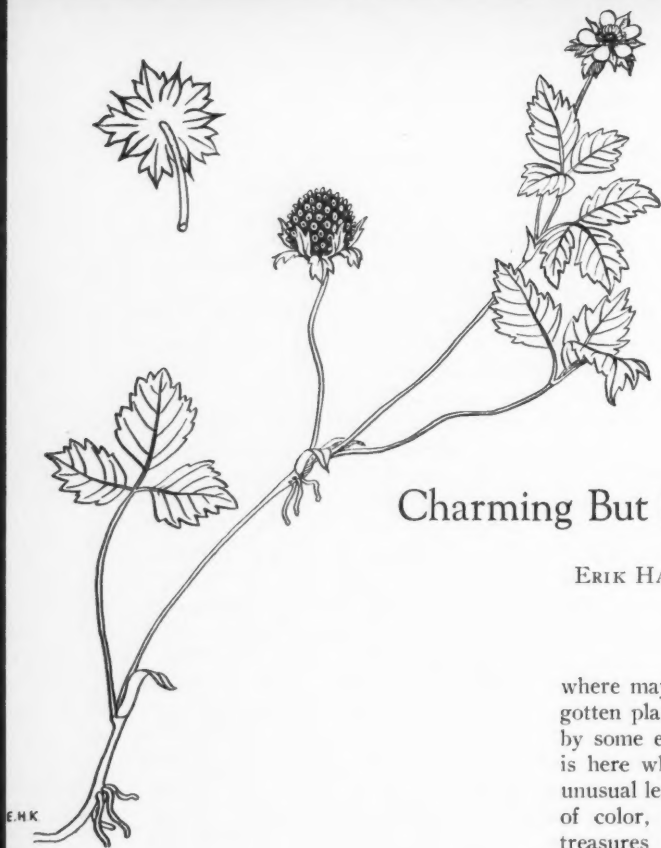
The New England Unit of the parent society has been very active and now has two gardens for the blind in operation. One is at Camp Allen, Bedford, New Hampshire, a summer camp for visually handicapped girls who vacation there as guests of the Boston Kiwanis Club. This garden consists of two fifteen-foot raised beds, with plank retaining walls, and narrow footpath between. There is an improvised step, or low seat, along the front of each bed, and youngsters can sit at any point along this edge and reach in among the plants. The Camp Nature-Study program includes talks at this garden spot, and youngsters enjoy the various fragrances and flavors, and mount leaves in their notebooks to carry home. Camp Allen accommodates about fifty children at a time, so the total number enjoying these herbs each summer is most encouraging.

The second herb garden, maintained by the New England Unit, is at Camp Sunlight for the Blind, (sponsored by the Massachusetts Association for Promoting the Interests of the Adult Blind), at Egypt, Massachusetts. At the Massachusetts Horticultural So-

ciety's Spring Flower Show in Boston in 1953, the Unit was asked to exhibit an herb garden for the blind. This little garden, designed by Mrs. Howard Laskey, Carolina, Rhode Island, was awarded honors, and was reconstructed at Camp Sunlight as a permanent gift. It is a formal garden: curved path swinging around a rocky pool in front, the two sectors of which lead to a thatched summerhouse centrally located, and the whole further unified by a high, curved sapling fence at the rear. The herb garden area is about thirty feet across by ten feet deep. The beds are of varying levels, of heavy creosoted boxes, the tallest bringing the herbs (with their Braille and type labels) waist high. An olive tree and lilac bushes flank the summerhouse with its table and comfortable benches. During the first summer, four hundred adult blind guests "saw" this garden, following the rustic handrail past the plants to the shady shelter, and Nature classes were also held here.

The herbs used in all three of these gardens are very much the same, comprising thymes, mint, sages, artemisias, lavenders and sweet-scented geraniums in variety, rosemary, horehound, hysop, costmary, marjoram, burnet, caraway, sorrel, chives, parsley, tarragon, ambrosia, bedstraw, wooly lamb's ears, bergamot, germander, santolina, etc.

Public interest in these gardens for the blind continues to grow, and it is understood that one of our largest botanical gardens now plans to construct one, and, as a preliminary, has sent representatives to see the garden at Lima. The value of these gardens, both educational and recreational, has already been established, and perhaps the next forward step will be to assist in setting up similar gardens on the grounds of the homes and schools for the blind, so that the pleasure and closer intimacy of care and maintenance might be added.



Charming But Forgotten Plants

ERIK HANS KRAUSE

where may be found many of the forgotten plants, perhaps already covered by some especially aggressive weed. It is here where an eye trained to some unusual leaf pattern, or a strange touch of color, may discover some of the treasures before they are completely buried by the green deluge of native vegetation.

Indian Strawberry—Duchesnia Indica

The present age of high pressure living has deprived us of the very place for contemplation and peace of mind—the old, somewhat neglected, but beloved garden.

So few know the enchantment of our grandparents' garden, with overgrown, pungent boxwood hedges, the unpruned espalier trees still bearing delicious, if somewhat deformed fruits, the shaggy lilac bushes rising from a carpet of white violets, and fragrant primroses.

Here Nature goes her own way, without the spirit and gnarled hands of the old master for guidance, and the free-for-all battle goes on between insects and plants, and the plants themselves. Gradually the less robust, and acclimatized, are forced to the wall, or, as it were, to the edge of the bed. That's

The strawberrylike plant shown in the accompanying drawing is the Indian relative of our strawberry. It seems strange that a plant from India does manage to thrive in this climate; it is also strange that the enticing fruit is rather insipid and deserves the popular name "Mock Strawberry." Also different from the *Fragaria* are the yellow petals and the very decorative calyx which is shown in a detail drawing. This specimen was discovered beneath the famous and venerable trees of the Barry garden not far from the castellated building bearing the name "Ellwanger & Barry." Here the *Duchesnia* is being overcome by *Vinca* and *Potentilla*, growing in the shade of cathedral-like beeches and the enormous leaves of the *Magnolia macrophyllum*.

The Lily

E. BUCKNER KIRK

"The Lelye is an herbe wyth a whyte floure. And though the leuys of the floure be whyte: yet wythin shyneth the lykenesse of golde."

There are pink lilies and red lilies, orange lilies and lilies of every shade of yellow from buttercup through lemon ivory; there are lavender lilies and purple lilies. For most of us, however, the word "lily" alone is the flower that the monk, Bartholomeus Anglicus, described seven hundred years ago.

It is not likely that the primitive form had the size and magnificence that thousands of years of cultivation have given the Madonna Lily, *Lilium candidum*. Yet, even in its earliest state, the petals must have had that characteristic whiteness and, beyond a doubt, within shone "the lykenesse of golde." Probably smaller and less stately than our modern type, it was still a flower to stir the heart and catch the imagination of even barbarous men.

For, in the case of the lily, the curtain of time can be pushed back to an almost unbelievable antiquity, pushed back for only a moment in which we think we catch a glimpse of the white and gold flower among half-civilized men struggling to build some sort of stable existence only to lose it to invading barbarians.

The Madonna Lily is native to southeastern Iran. In the neighboring Tigris-Euphrates Valley, a people, whose origin is still unknown, established the prehistoric civilization of Sumer which, at its peak, overflowed into Persia. Roughly about a hundred miles from

the Tigris was a city which became a part of the Sumerian empire. Beyond Sumerian jurisdiction roamed nomadic tribes that were, in the latter part of the third millenium B.C., united by one Sargon who conquered the Sumerians and set up an empire of his own, the Semitic empire of Agade. Contemporary tablets of his reign have been deciphered and on one of these we find a reference to the Persian city Susa, the Lilies. The conquest is described in words that might be considered the essence of tact or understatement: "At Agade Sharrukin-lubani (Sargon), a gardener and cup-bearer of Ur-Ilbaba, having been made king . . ." These inscriptions date from circa 2872 B.C.

It is impossible now to be sure that the word 'Susa' then meant the Lilies or whether the name was applied to the native flower later. There is, however, the temptation to speculate on the possibility that a conqueror who was also a gardener might have had a hand in the matter. He could hardly have failed to notice the conspicuous local flower. What was more natural than to use its name to rechristen the city so newly his? But that is just guessing for fun. All that we know with any certainty is that the earliest recorded mention of the word 'Susa' dates from Sargon's time. It may or may not then have meant 'the Lilies,' but, since the question is an open one, there remains the possibility that it did, and in that case we have a reference to lilies nearly five thousand years old.

I am indebted for this excursion into the dim reaches of prehistory to the

MacNeils' valuable and interesting book, *Garden Lilies*. They have done a masterly job of research on behalf of the flower in which they specialize and it would be an impertinence on my part to continue to quote them. They carry the lily briefly, but with authority, from its original habitat in Iran through Asia Minor into Egypt, Greece, Rome and down into modern times. So I turn off into one of the Mediterranean byways where, like the iris and the crocus, the lily played a part in the Minoan religion of ancient Crete.

"The Lily," Sir Arthur Evans states without qualification, "is preeminently the Minoan sacred flower." And again, it is a "special attribute of the Great Minoan Goddess."

This goddess stemmed out of Neolithic times and maintained unchallenged supremacy in Crete until, after the mysterious cataclysm that befell Minoan civilization in the middle of the sixteenth century B.C., the cult was gradually assimilated into that of the Greeks.

Now the interesting thing about Minoan religion was that it was monotheistic. In Greece, as elsewhere in the ancient world, a multiplicity of gods and goddesses developed a disunited pantheon of clannish dieties who carried on feuds among themselves as briskly and enthusiastically as did their worshippers below. "Surveying the whole field," says Sir Arthur after discussing some of the cults of antiquity, "it may be confidently said that so far as the evidence goes, of all these kindred religious systems, that of ancient Crete and the Minoan world stands out as the purest and best . . ."

Naturally we do not know at just what date the lily became the symbol of the Minoan goddess, nor do we know with what other goddesses of the far past it may have been associated

until we get into the familiar field of Greek mythology. There it was clearly attributed to the chief Greek goddess Hera. From Greece it was passed on as a symbol to Hera's Roman prototype Juno. It has, of course, within our own era become an attribute of the Virgin Mary from whom it gets its modern name, Madonna Lily.

So for literally thousands of years the lily has played a part in human history as a religious symbol typifying with its white and gold all that man could imagine of goodness and purity.

Lilies have also had their share in the specialized symbolism of heraldry. But before noting any point of heraldic interest about lilies, the fleur-de-lis problem must be faced. My own views, based as I believe on valid data, were explained in an article on the iris, and appeared in the April 1953 issue of this Magazine. But in fairness to those who believe, or want to believe, that the fleur-de-lis originated in a lily, I refer them to the books of an eminent modern authority, Mr. Arthur Charles Fox-Davies who favors the lily.

There are, of course, certain families in England who have lilies on their arms. It is obvious enough why they occur on the arms of Lilly of Stoke Prior, or on those of J. E. Lilley of Harrow, but the reason for their appearance on the crests of various families by the name of Chadwick is obscure. But once there was a reason and that reason I would dearly like to know.

The frequency of lilies on the arms of educational institutions stems back to the time when all such institutions were under the jurisdiction of the church and an attribute of the Virgin's probably seemed an appropriate symbol for establishments devoted to youth. The University of Aberdeen, King's College, Cambridge, and the schools of Winchester and Eton all display lilies on their arms.

Eton and King's were both founded by Henry VI, that pathetic son of the hero of Agincourt. He was a rather appealing and very tragic figure. Succeeding to the throne at the age of nine months, he grew to manhood without the warlike and statesmanlike virtues his father had had and that he so sorely needed in an England harrassed by civil war, the War of the Roses. Henry seems to have inherited more of the gentleness and sweetness of his mother, Katharine, the delectable 'French fleur-de-lis' of Shakespeare's Henry V. He was more scholar than warrior, student than statesman. In the course of a harried life that ended on a block in the Tower of London, the establishment of two such schools as Eton and King's must have been among his few pleasures. He seems to have enjoyed working out detailed plans for them. Both were given almost identical coats of arms except that where white lilies appear on Eton's, King's had white roses. To a scholar, Nicholas Cloos, who helped the King with his educational schemes, Henry granted arms which also displayed roses and lilies.

On the 23rd of May, 1471, Henry repeated his Latin prayer and bowed his head to the axe. Now each year on that day Eton and King's celebrate the Ceremony of the Roses and Lilies. There is a service which includes Henry's own prayer and ends when the Provosts of the two establishments lay the white roses of King's and the white lilies of Eton on the spot where the king was beheaded.

As a postscript to this episode, it would be interesting to know why Henry, last of the Lancastrian kings whose badge was a red rose, chose white roses for his college at Cambridge.

In comparatively modern times an orange lily became briefly a political symbol. Somewhat before the French

Revolution there was so much anti-royalist agitation in Holland that the members of the House of Orange had to flee the country. Along with the royal family the orange lilies came in for trouble. Radicals went so far as to prohibit the sale of oranges and carrots in the markets, while the gardens were despoiled of their marigolds and the bulbs of all orange lilies.

In Ireland, too, I believe, there have been flying shillelaghs, broken heads and bloodshed because some Protestant Irishman invited trouble by sporting an orange lily in his "bonnet."

But generally speaking, the political significance of lilies has been negligible.

Naturally around so potent a symbol as the lily myths and legends cluster.

The most famous, of course, is the Greek myth which gives both the origin of the Milky Way and the lily itself. Zeus, wishing to make the infant Hercules a god, asked Hera to endow him with divinity by nursing him. Hera was always only too happy to thwart her husband, so she refused. Whereupon Zeus ordered Somus to give Hera a sleeping draught. While she slept Zeus put the child to her breast and the greedy baby sucked so lustily that the milk flowed faster than he could swallow it. Some of its splashed over the heavens to become the Milky Way. Some drops fell to earth and from them sprang up the white lily—the emblem of purity.

The sight of its whiteness, thus a related myth continues, set up such a lively jealousy in Aphrodite, who had herself issued from the whiteness of sea foam, that out of pure spite she had a huge pistil set in the midst of the flower. The Freudians may take over from there on, weaving together as they see fit such scattered items as that the lily was sometimes attributed to the Satyrs; that St. Louis de Gonzague, protector of youth, is usually pictured with a lily

in his hand, while a lily is attributed also to St. Anthony, protector of marriages; and finally that, according to Albertus Magnus, you can tell with a lily whether or not a young girl is a virgin.

Now it seems most unlikely that the great thirteenth century cleric busied himself with such matters, however interesting they may be to the lay mind. It is far more probable that this particular item comes from *The boke of secretes of Albertus Magnus*, a spurious collection of herbal lore, magic and superstition which was immensely popular during the Middle Ages and accepted as the authentic work of the distinguished scholar.

In German folk lore there is a legend to the effect that white lilies will spring from the grave of anyone unjustly executed. When the English anthropologist, Thorpe, added this item to his collection in *Northern Mythology* about a hundred years ago he was innocent of all irony. The Germany he knew was a civilized land in which scholarship and the arts flourished. He would have been incredulous that it could retrogress to a point where, if this legend had validity, square mile upon square mile of German soil would be white with lilies.

Anglo-Saxon folk lore has a pleasant contribution to make in regard to the lily. With a lily and a rose you can foretell the sex of an unborn child. You approach the expectant mother carrying a lily in one hand a rose in the other. If she chooses the rose her child will be a girl—the lily will bring her a son.

Even the white and gold of the lily fails to lighten the terrible period of history known as the Dark Ages. After the fall of Rome the accumulated knowledge of mankind was, for all practical purposes, lost and life was so dreadful a struggle for bare existence

that there was no time for speculation or experiment, no time to reason or create. The monasteries cherished the few books they owned and monks made copies of these to enrich other monasteries, but without venturing into any critical or creative activities. The world outside the monasteries fought endless wars from local raiding forays to fairly large-scale hostilities. Individual men toiled for food and clothing and shelter. Only after the feudal system had begun to bring some order out of the chaos was it possible for humanity in Europe to start over again, almost from scratch, the slow business of learning once more to use reason and the creative faculties.

If that seems a roundabout introduction to the lily in medicine it can be illustrated.

During the Dark Ages, and for many centuries following them, the herbal of Dioscorides was the chief authority for medical practice. But copies of *de Materia Medica* were available to only a handful of literate men. In those could be found classical medical writing that was the essence of clarity and simplicity. Dioscorides used lilies, for instance, in prescriptions for female complaints, snake bite, burns, wounds, ulcers, leprosy, kidney or gall stones and erysipelas. These prescriptions were made up with wine, vinegar or honey and to one flour was added to make a plaster. Modern medical science has proved the whole series worthless but even the most orthodox modern doctor must admire the cleancut manner in which the Greek herbalist set forth his instructions.

In contrast, the few original medical writers of the Dark Ages have left us a fantastic farrago of superstition, pre-Christian magic and local lore. And to this they added such bits and pieces of classical medicine as they could collect.

The *Lacnunga*, for example, is a

leechbook containing the earliest examples we have of Anglo-Saxon medicine. In it is a prescription for a burn medication which reads: "Take lily and yarrow, boil in butter, smear therewith." It is easy for even the most unscholarly to see that this stems straight out of Dioscorides or some other writer of classical times. For by far the greater part of the leechbook falls back on the supernatural as men have always done, time out of mind, in periods of great stress.

Thus, to make a "holy salve"—its use is not specified in the *Lacnunga*—fifty-eight herbs, including the lily, and the dust of a black snail, are needed. Butter must be made from the milk of a cow all of one color, red or white, no spots. Water was then hallowed in the baptismal font, but when or how it was incorporated is unclear. The butter went into a jug on which the names Matthew, Mark, Luke and John were written and was then stirred with a spoon "formed into a bristle brush"—whatever that may mean. Over this two psalms were sung three times. Next the *Gloria*, the *Credo*, *Deus et pater*, and *In principio* were intoned. These sacred exercises were followed by the "worm chant." This jumble of Latin, Anglo-Saxon and gibberish must have been so old by the time the *Lacnunga* was written down that its meaning had long been lost, but its potency was still revered. And it might be bad luck to leave it out. We then return to the herbs which were "laid by the jug," spat upon, blown upon and hallowed (perhaps with the forgotten water). Finally the priest sang mass over the lot.

Here, it is clear, very ancient magic had been made respectable by the church itself. Few ecclesiastics of the time were more enlightened than their flocks and, according to their simple reasoning, the way to combat the ancient practices was to substitute Chris-

tian prayers for the older heathen charms.

In 1161, Odo of Meune, a town on the Loire, wrote a rhymed treatise on the properties of herbs that became known, for some unknown reason, as *Macer's herbal*. It was immensely popular throughout the Middle Ages and, since an herbal was a necessary part of the equipment of any great lady, a copy of these verses was given to Philippa of Hainault when she married Edward III of England. Even a queen, in those days, had to know how to dose her household.

The manuscript that the English king's bride brought to her new home was an English translation of Odo's Latin original. How much it had suffered in translation and by the "improvements" of well intentioned scribes, it is now impossible to tell. But it was entirely in keeping with the spirit of Odo's time that he should use such scraps of classical medicine as he had been able to assemble, together with what seems obviously to be practices derived from ancient local magic.

For the white lily, Odo gives conventional enough prescriptions that may derive from Dioscorides. One tells how to make a plaster that will "rypvth ye sor sothly." The lily of the field, however, that is described as yellow as saffron, served for some rather sinister magic. It must be gathered when the sun is in Leo, between the 15th of July and the 13th of August. If then it is mixed with some laurel leaves and buried under a manure pile, it will breed worms that are large and fierce. Of these worms a powder can be made which, dusted on the clothes of an enemy, will prevent that unfortunate person from sleeping "be nyth ne day." Or fed to the victim in milk, it will cause him or her to come down with fever. Fed to cattle, their milk will be dried up.

If all this sounds very confused so

far as medicine is concerned, that is exactly the point. For after Rome fell there was nothing to take its place except scraps and bits of classical civilization, current superstitions, dimly remembered practices of prechristian magic, and the growing but not yet powerful force of the Church of Rome.

The later history of the lily in medicine is rather monotonous. With the exception of snake bite, when he directed that lily seed be administered in a drink, Dioscorides had used lilies only externally. And medical practice down into the nineteenth century followed his lead for, with negligible exceptions, lilies appear only in prescriptions recommending them as ingredients for plasters, salves, and ointments.

The ointments carry us neatly from professional medical practice into the still rooms of castle and manor house where lilies were of vast importance. For Dioscorides made a statement that was to echo through aging female hearts for eighteen hundred years: lilies "being beaten small with honey . . . cleareth ye faces & makes them without wrinkles."

Man, or rather woman, being the complicated creature she is, would often, no doubt, have preferred to use "Susinon," the more elaborate oil of lilies of the two recommended by Dioscorides as cosmetics. But many a lady in northern Europe must have been frustrated and forced to fall back on the simpler preparation for lack of three thousand lilies. And the making of Susinon was a fabulous undertaking requiring days of laborious mincing, boiling, straining, scumming and pressing. But the final result yielded three batches of oil of a strong, medium and weak fragrance.

When I said above that Dioscorides' recommendation was to echo through eighteen hundred years, I was being quite mathematically exact. Not long

ago a New Hampshire neighbor loaned me a cook-book called *Old Dr. Carlin's Receipts* that had belonged to her grandmother. Old Dr. Carlin, like many of his predecessors, included all sorts of useful information other than culinary lore in his book. How to etch on ivory, for instance; to caponize a fowl; to hang wall paper; to decorate a carriage with "decalcemine" pictures.

The exact date of old Dr. Carlin's book has disappeared along with the title page but, as I leafed through it, I found a newspaper clipping cut out to preserve a receipt for cracker pudding. Idly enough I turned this over and read: "Sweeter words were probably never heard by Mrs. Seward and her son and daughter . . . When did I hear of Pres. Lincoln's assassination? When Surg. Gen. Barnes came (in response to a message Miss Seward dispatched at once) . . . The surgeon general came to take my place at the bedside. As he did so—" the cracker pudding ended on the other side and we are not to know what the surgeon general said about Lincoln's assassination. A clipping cannot, of course, date a book, but it, along with the paper and format, is an indication that the book probably appeared in the late 1850's or early 1860's.

Among the oddments described by old Dr. Carlin is a "Pomade to Remove Wrinkles." Two ounces of onion juice and one of white lily (part not specified), two ounces of honey and one of white wax are put in a warm place to melt together. Then, after stirring with a wooden spoon, the mixture is allowed to cool. "Apply at night and do not rub off until morning."

The New Hampshire housewife, who cherished the receipt for cracker pudding, may well, as the years began to overwhelm her, have made up a batch of old Dr. Carlin's ointment unaware of the fact that the use of the white

lily to combat wrinkles dated back to a doctor who practiced in the days of Nero.

Time, and perhaps wishful thinking, brought elaborations to the cosmetic use of lilies. For between Dioscorides and old Dr. Carlin there were many other cosmetic prescriptions. As early as the fourteenth century, there is one for making "a face whit" and, after directions for compounding the mixture, the assurance that it will "do away the spottys."

Sir Kenelm Digby had nearly as many claims for his "Precious Cosmetick, or Beautifying Water" as any modern "beautician" would advance for a facial treatment. He says that lilies, distilled along with some seventeen other ingredients, make a water that "smoothes, whitens, beautifies & preserves the Complexion of Ladies. They may wash their faces with it at any time, but especially Morning and Evening."

It remained for the eighteenth century to carry the lily's cosmetic use farthest away from the original wrinkles. Along with various other plants, ashes and lye, they were boiled to make a water in which the hair must be frequently washed if the anxious operator hoped to have it "change in a little time to a beautiful flaxen colour."

Lilies in still rooms were not confined, of course, to cosmetic receipts, but their homemade medical aspects differed hardly at all from the professional herbalists' remedies, except in one case I remember. Elizabeth, Countess of Kent, used white lilies among other herbs in one of those pathetic prescriptions that run so tragically through all old medical books and that sadden one to read: "For the biting of a mad dog."

Lilies as food are a fascinating subject made quite maddening by lack of material. The MacNeils' have an in-

teresting theory that the spread of *L. candidum* throughout the Near East was effected accidentally by prehistoric nomads who carried the bulbs for food on their journeys. Whenever a bulb, or even a scale of a bulb, dropped a colony of the plants might spring up.

In China and Japan, the bulbs of the tiger lily are a common article of diet as are also the dried perianth segments. These last used to be imported into this country for use in Chinese restaurants. In Japan, the bulbs of *L. auratum*, however blasphemous this may sound to American gardeners, are often eaten.

In her book on lilies, *Garden Cinderellas*, Mrs. Fox gives a few recipes for serving lilies as they do in the Orient, but when it comes to England and northern Europe there are only tantalizing hints that lilies were used in the kitchen, though I could not find any specific directions as to how. At the beginning of that fifteenth century cook-book quoted so often by Mrs. Cecil in her *History of Gardening in England*, Martagon lilies are listed among the herbs for pottage and among the herbs for "Saveur and beaute." Then, to add insult to injury, I found that a pottage of lilies was served in the third course of the banquet given after the coronation of Henry IV in 1399. But search as I did in the early cook-books I found available, I was not able to discover a single recipe that called for lilies.

In curious and interesting and exciting ways, wild lilies came to be tamed to our gardens. I never look at a fine staff of regal lilies without remembering that a man nearly lost his life and was seriously injured getting them from the Chinese-Tibetan frontier to this New Hampshire and other occidental gardens. All the majesty of *L. auratum* merely arouses in me a malicious hope that, when the record is finally checked, it will not prove to be

that insufferable snob Parkman who first brought it to flower in the Eastern Hemisphere. And the Easter Lily, the Madonna Lily—though more often *L. longiflorum* now than *L. candidum*—brings to mind first of all Fra Lippo Lippe's Annunciation in the Uffizi in Florence, and then carries one on and on back, through Greece and Crete and Asia Minor, to the first dim beginnings of civilization that we know.

When and how the Madonna Lily reached northern Europe is an intriguing question. The MacNeils' theory as to how it was disseminated through the Mediterranean area makes good sense, but it throws no light as to when and how a flower from the heat of the Persian Gulf learned to flourish in the cool damp gardens of England and northern Europe.

One writer has made the inevitable guess that it was brought by the Crusaders. Parenthetically, it would be interesting if someone were someday to stumble on actual documentary proof that a specific plant found its way to the north in the shape of seed or bulb included in the loot some Crusader brought home. To the best of my knowledge, such conclusive evidence has not been found. But that has proved no deterrent. Whenever there is a gap in the history of a Mediterranean plant which eventually succeeded in north Europe, the Crusaders are nearly always credited with its introduction. No one, I suspect, would be more surprised than they who looked rather to precious metals and jewels, ornate weapons, and fine textiles as worthy of their attention.

In the case of the Madonna Lily especially, we cannot get off with an easy guess about the Crusaders, for Waharid Strabo counted it as equal to the rose in his German garden in the Benedictine Abbey at Reichenau about 840. The first crusade did not get under way until 1096.

The explanation as to how it reached Germany so early may lie in a theory advanced by Mrs. Cecil. She had no doubt that *L. candidum* came to England with the Romans. The homesick men who administered that outpost of empire built themselves villas and baths and temples as much as possible like those they had known in Italy. And near their villas must have stood their gardens where they grew plants imported from home. After the Roman legions were called back to help defend the capital from invading barbarians in 410 A.D., only those flowers that were thoroughly acclimated could possibly have survived the centuries of neglect that followed.

For once the Romans were gone, the Northmen swept into England in wave after wave. Angles, Saxons, Jutes and Danes came and conquered. In the scanty intervals between, internal upheavals kept the unhappy island in a state of perpetual turmoil until, after the Norman conquest, a sort of order was restored.

Hardy survivors, Mrs. Cecil calls those plants that came through six and a half centuries of neglect. By the time a stable existence had been achieved in England, men had come to look on the white lily as a native and, later still, men, Gerard among them, were to take this for granted. Strabo's white lily might well have been a hardy survivor of the Roman occupation of Germany.

A very large number of the most popular lilies in our modern gardens have come to us from Asia, most of them within the past century. Few stories of travel and adventure can equal those of the plant collectors working along the Chinese-Tibetan border where many of the lilies we know grow at high altitudes. It is an incredible country, incredibly beautiful, incredibly wild, and incredibly isolated from anything we call civilization. And the men

who have traveled it, and similar remote parts of Asia, are not only interesting to gardeners everywhere, but should be remembered and honored for the risks they ran, the hardships they endured, and the perseverance they displayed in the face of almost insuperable obstacles.

They were professionals, these men, trained botanists, and they were paid to do the work. But, like true professionals the world over, they were earning their living at jobs they loved. They often risked their lives to gather flowers or seed—sometimes on a precipice, sometimes by crossing a flimsy bridge over a wild gorge, sometimes from the wrath of natives who, especially on the Tibetan side of the border, were convinced that no one in his right mind would dare the heights except for gold. All this talk about flowers was camouflage. There is gold in the Tibetan alps and the church that rules the country has made it clear that evil spirits and demons will punish with sleet and hail, thunder and lightning those impious men who invade the high fastnesses. After a storm many a botanist has trembled to return to the native village he left below, for fear that hail may have destroyed the scanty harvest. If that happened, who could be to blame but the foreigner who had obviously called down the wrath of the mountain demons?

In books easily available today—the books of Reginald Farrer, who died of fever on the job, of E. H. Wilson, who brought us the regal lily and nearly lost his life in so doing, of Frank Kingdon-Ward, E. H. M. Cox and various others—those who are interested can read the stories of these adventurer-botanists.

But betwixt and between the ancient and modern introductions of lilies is another story that nearly concerns us as Americans.

The three great lilies of our eastern

seaboard were early valued in European gardens—*L. canadense*, *L. superbum*, and *L. philadelphicum*.

No one seems quite sure when and how *L. canadense* reached Europe. If it is true, as often stated, that it was brought back in 1535 by the French explorer Cartier, it is understandable that no record remains. In that case it would have been merely a trivial item among the exciting discoveries on a new continent.

L. superbum came next and led me a fruitless but fascinating chase. A Belgian botanist named de Cannart d'Hamale went into the matter in some detail and stated that this lily was sent by Benjamin Franklin to Peter Collinson in 1727. All that I asked then was to find Franklin's covering letter. That would be fun to read. It was not, however, in any of the ten volume editions of Franklin's complete works, nor was it mentioned in Carl Van Doren's fine life of Franklin. But from the latter I learned that in 1727 Franklin was only twenty-one years old, an up-and-coming young man about Philadelphia it is true, but not yet in a position to carry on correspondence with notables abroad. I also learned that Franklin's acquaintance with Collinson did not begin until about ten years later and that some of his letters to the Englishmen were in the Morgan Library. I figured that 1727 might be a printer's error for 1737 and that the letter that went with the lily might possibly be in the Morgan collection.

In what form, I wondered as I waited for my library request slip to be honored, would such treasures as autographed letters of Benjamin Franklin reach me? They came in a very large thin book bound sumptuously in green morocco and beautifully tooled. Tipped carefully onto the blank pages, each letter leaped at one, entirely legible in spite of the browning ink. They were all about the experiments with electric-

ity—perfect source material for the historian of electrical development but far removed from my flowers.

I report this futile search on the off chance that some day a letter of Franklin's or Collinson's may come to light recording the sending or receiving of *L. superbum* and so upholding de Cansart d'Hamale's contention.

It is, however, my own conviction that he made a mistake. Both *L. superbum* and *L. philadelphicum*, I feel reasonably sure, reached England from one of the most interesting figures in our early history—a figure not of such stature as Franklin but his contemporary and friend, a fine human being in his own right and our first botanist—John Bartram.

"I have the pleasure to tell thee," Peter Collinson wrote Bartram from London in September 1736, "that the noble Marsh Martagon flowered with me, which thou sent me this spring. It is a delicate flower." That, of course, was *L. superbum*. Somewhat later *L. philadelphicum* figures in the correspondence and Collinson inquires of Bartram whether the plant in its native habitat always produces only a single flower to a stalk as his specimen does.

Chasing down the date of an introduction is a pedantic occupation, sometimes a tiresome one, and one is rarely as richly rewarded as I was by coming across the correspondence of Bartram and Collinson. Here, in these informal letters of two men with similar tastes, one steps completely into the world of two hundred years ago. Both men were members of the Society of Friends and both were passionately interested in natural history. But there the resemblance ends. Collinson was a busy merchant in a great city, a member of the Royal Society, the friend and associate of distinguished men. He knew Linnaeus and at that time the even more famous Doctor Gronovius of Hol-

land. Various British peers shared his interests and were eager to have his help in getting new botanical specimens for their gardens. Bartram, on the other hand, lived not far outside Philadelphia and, while he was no frontiersman, he was still a son of a new world, a sparsely settled country, innocent of sophistication, and where most men were still hard at work on the land.

Yet it is the very differences in background that makes for the amusing paradox that appears in the letters and that makes them so utterly engaging. For Collinson, the man of the world, is the enquirer, and Bartram, the farmer-turned-naturalist, is the mentor who explains and instructs.

In spite of the gains, we have lost much in our own time by specialization. One rarely hears of "natural history" any more. This man is interested in birds, that in flowers, another in fungi. The enormous amount of data now collected about such things is so great that a man can spend a lifetime studying one species of a genus. In the early eighteenth century, much of that data was still to be gathered and men of lively minds were free to scatter their interests far and wide—and so they did. To read Collinson's letters to Bartram is to be reminded of an exceptionally intelligent small boy bursting with curiosity about all the wonderful things the New World contained.

We have now come through nearly five thousand years and entirely around the world with lilies. Even though those of Palestine have been identified as the brilliantly colored anemones, lilies live for all of us, forever, not only in our gardens but in the beautiful ageless words: "Consider the lilies of the field, how they grow; they toil not, neither do they spin: And yet I say unto you That even Solomon in all his glory was not arrayed like one of these."

The Bottlebrushes Like Wet Feet

EDWIN A. MENNINGER¹

Bottlebrush trees—the name commonly given to about fifteen species of *Callistemon* native to Australia—seem to offer Florida some much needed material for highway planting in low areas. Many of our roadside ditches are often called upon to carry heavy overflows, and flooding is detrimental to most trees. But the bottlebrushes are specially suited to low, damp, badly drained situations, some of them are fairly hardy, and they grow fast. Certainly these ornamentals from down under are worthy of extensive trial to determine which of them thrive under our growing conditions.

Two or three species of *Callistemon* have been grown by central and north Florida nurserymen for years, but the genus has been much neglected in the southern half of the state, and no planned effort has been made to get acquainted with other available species,

some of which are more ornamental, grow better, and are generally more satisfactory than the common kind. Because of the need for an actual experience rating for the trees, the author has under cultivation in his garden in Stuart, Florida, the following species of *Callistemon* which represent practically every known member of this interesting family:

Callistemon phoenicius, Fiery Bottlebrush. This is a six-foot shrub from western Australia, with narrow, thick, veinless leaves and blossoms much like those of *C. citrinus* except that the growth is stiffer and exceedingly dense, the stamen brushes are bigger and a richer red, and the plant is a shrub rather than a tree. Lord² says: "This is probably the best and most brilliantly-flowered of all Australia's bottlebrushes. It does particularly well in

¹The Flowering Tree Man, Stuart, Florida.

²Ernest E. Lord, *Shrubs and Trees for Australian Gardens*.



low, moist areas and relishes a clay soil. The narrowly-lanceolate leaves are two to four inches long. The seed pod buttons are often a half inch across.

C. salignus, Pink Tip. Willow Bottlebrush and White Bottlebrush are other accepted common names. It is a creamy-white-flowered tree from eastern Australia, with a paper bark, says de Beuzeville: *Australian Trees for Australian Planting*, and a very dense, shapely crown of small rather prickly-pointed, dark green leaves; "the young leaves and shoots form a foot-long terminal of beautiful pink tint, giving the plant a most ornamental appearance, and from which its popular name is derived." The tree flowers in Australia in late Spring (October-November), making a fine display of bloom, and the pink tips linger for some time after the flowers disappear. The creamy or pale yellow stamens (rarely light pink) are usually under a half inch in length. The tree prefers a moist situation, thriving in badly drained areas; it grows fast, gives good shade, stands some salt, likes clay soils, and is moderately frost resistant. It does well on dry land, if watered. Pink Tip is a good tree for highway planting under telephone wires, as it rarely exceeds 15 feet, though occasionally it may go to forty feet. The timber is one of the hardest of all Australian woods.

C. pinifolius viridis, Green-Flowering Bottlebrush. This amazing New South Wales tree looks like a pine (*Pinus* sp.) because it has rigid two to four-inch needlelike leaves, and its Kelly-green bottlebrush flowers, produced in spring when the plant is less than two feet high, could scarcely be called beautiful, but they are in striking contrast to the dark green foliage. I first saw this rare tree in one of Peter Riedel's parks in Santa Barbara, California, growing on a clay hillside. It also likes moist situations. George W. Althofer of the Nindethana Nursery,

Dripstone, New South Wales, writes: "An interesting thing I noticed about *C. pinifolius* along Duck Creek, Auburn, was that both the brilliant crimson and bottle-green forms grew there side by side. There was also a number of in-between colors. The progeny of the bottle-green plant, however, could not be depended on to give a hundred per cent green flowers. At least thirty per cent were red and a smaller number pale reds or yellowish."

C. speciosus, Showy Bottlebrush. Albany Bottlebrush is also an accepted common name. Ivo Hammet considers this West Australian species the finest of all the bottlebrushes, with *C. phoenicis* a runner-up. Certainly in Florida it has proved itself the most spectacular in bloom. It makes a handsome, bushy tree to twenty feet. The deep-red flower spikes to six inches long are tipped with gold, and, although spring is the accepted blooming time, it repeats frequently through the year. The narrow, two to four-inch lance-shaped leaves have a prominent midrib. Ernest E. Lord, in *Shrubs and Trees for Australian Gardens*, recommends that this tree be freely used in gardens and in highway planting. In this connection Mr. Lord sent a photograph with this comment: "The photo of the bottlebrush (*Callistemon* sp.) is taken from a few feet away but shows both flowers and leaves perfectly. The plant is in the shrubby stage at time of photographing, with flowers right to the ground. This is the general habit of most species of *Callistemon* with us for many years. Eventually some of them do become treelike with a single trunk, given a little pruning below. I call to mind a street in Hornsby, an outer suburb of Sydney, where I tried to snap a record of magnificent bottlebrushes, perfect standards twelve feet high, blood red with blossom, but light was poor and I did not get a good picture. The *Callistemon* picture I am sending



George J. Farnham

Callistemon salignus

you is *C. citrinus* (Syn. *C. lanceolatus*), indigenous to our eastern states, but it could almost as well illustrate the Western Australian *C. speciosus* (slightly shorter leaves and with more gold on anthers), or *C. phoenicius* (more shrubby, but brilliant in flower). It takes us all our time to distinguish the species if we get a bit out of practice."

Some confusion of names resulted several years ago in Florida when the

U. S. Department of Agriculture introduced a tree labelled *Melaleuca genistifolia* which should have been labelled *Callistemon speciosus*. Peter Riedel of Santa Barbara, California's leading authority on introduced plants, helped to clarify this mix-up: "Your specimen is *Callistemon speciosus*. It could not be *Melaleuca* because the stamens are not united in five bundles. I enclose a small sample of *M. genistifolia* of which the flowers are white. The error is



George J. Farnham

Callistemon viminalis

excusable because Nicholson's *Dictionary of Gardening* says *M. genistifolia* has red flowers and H. M. Hall groups it with the red-flowered ones. I received the seed of the first *M. genistifolia* grown here direct from Professor J. H. Maiden, so there is but slight chance that it is incorrect."

C. violacea, Violet Bottlebrush. This rare plant is described in the catalog of Nindethana Nursery, Dripstone, N. S. W. as "a tall, dense-growing shrub with violet flower spikes. It reaches twelve feet."

C. lilacinus, Lilac Bottlebrush. E. Cheel, curator of the National Herbarium, New South Wales, wrote: "*C. hortensis* was raised from seed obtained from Berlin under the name *C. amoenus*, a yellow-flowering species, probably only a form of *C. salignus*. From *C. hortensis* I have obtained *C. lilacinus* [Cheel spells it *lilacina*.] which was probably obtained as a result of hybridism. The first batch of seedlings raised from seed of *C. hortensis* was planted out and at least three color forms were produced, two-thirds garnet-colored spikes like the parent plant,

and the other third creamy-white and lilac-colored species. It would seem that *C. hortensis*, misnamed *C. amoenus* by Berlin and Italian seed merchants, is also a result of hybridization." In Florida, this *C. lilacinus* has not yet bloomed for me, but D. J. McSwiney in Fort Lauderdale has bloomed the hybrid *C. lilacinus carmina*, an eight-foot shrub with carmine flower spikes and golden anthers.

C. linearis, Narrow-Leaf Bottlebrush. Harris writes in *Australian Plants for the Garden*, that this red-flowering form from sandy soils along the warmer east coast of Australia makes a fairly dense hedge ten to fifteen feet high, if planted at four-foot intervals. The tree has long, stiff leaves and deep red brushes to six inches long in spring and summer. The four to five-inch narrow leaves are grooved on the upper surface.

C. citrinus, Lemon Bottlebrush. (Syn. *C. lanceolatus*, *C. acuminatus*). This commonest form of red-flowered bottlebrush tree has been planted through central and north Florida for years, to the neglect of many improved

forms and better species. It makes a ten-foot bushy tree with faintly lemon-scented leaves. The flower heads are crimson, compact and upright. In Australia, this plant is often used for fairly dense hedges, planted at three to four-foot intervals. The most desirable improved form of this tree is known as *C. citrinus splendens*, a plant of garden origin raised many years ago at Kew from seed received as *C. laevis* from an Australian source that can no longer

be traced. In moist climates like England and the San Francisco bay region of California, this tree is more spectacular in flower than *C. speciosus*. The young leaves are pink and silvery. The big bottlebrush flowers are shiny vermilion, each stamen tipped with gold. The tree flowers with great freedom and makes a magnificent show. It is probably hardier than most of the bottlebrushes, and does not mind the cold of Feltham, Middlesex, England.

Callistemon rugulosus

George J. Farnham



C. paludosus, Swamp Bottlebrush. This useful tree from the swampy lands of New South Wales grows from fifteen to 30 feet high. It has narrow, sharp-pointed leaves and bears pale-yellow bottlebrush flowers in late spring or summer. It is a handsome plant for the bog garden.

C. viminalis, Weeping Red Bottlebrush. Much planted in both California and Florida, this makes a tree often to sixty feet, though normally much smaller and easily kept in bounds. It has a scaly bark, willowy branches, and four-inch light green leaves that are covered when young with bronzed hairs. These are found at the tips of all branches in



Patco Roberts

Callistemon rigidus

spring and often are as ornamental as the long, red flower spikes that appear soon after the new foliage. In New South Wales, this tree, which grows naturally on river banks, is often alternated in hedges with the yellow-flowered *C. salignus* to provide a highly ornamental effect, as the trees bloom simultaneously.

C. rigidus, Stiff Bottlebrush. Though native to the rocky sandstone ledges near Sydney, New South Wales, this species is fast disappearing there. It is a fifteen-foot shrub with foliage to the ground, very stiff and slow-growing, with narrow, crowded, five-inch leaves, and bearing twice a year six-inch,



Patco Roberts

Callistemon speciosus

dense, crimson bottlebrush flowers. It is much planted in sandy locations near the coast, and endures hard, dry conditions.

C. rugulosus, Crimson Bottlebrush. (Syn. *C. coccineus*.) This shrub of ten to fifteen feet from New South Wales is particularly happy in fresh water swamps, or in constantly wet sandy soil on the coast. It has rigid, rather narrow two-inch leaves, and bears large scarlet flower spikes in late summer or autumn. The spikes are short, but are described by Harris as "very handsome."

OTHER SPECIES. Besides the dozen kinds of bottlebrush trees here described, the author has one *Callistemon* tree with pink bottlebrush flowers, and another on which the spikes are wine red. The identity of these has not yet been determined, but they doubtless are hybrids or variations of some of the trees described.

Seed Germination

R. MILTON CARLETON¹

All too often, gardeners feel that all they have to do is to stick seed into the soil and it will grow. If it doesn't, it must be dead. They ignore the fact that the original home of the species might have been tropical Africa or northern Europe, South America or the slopes of the high Himalayas, with needs peculiar to that region.

True, some seeds have wide tolerance for heat and cold, moisture and drought, and survive almost any treatment. Perhaps the most tolerant of seeds in commerce are those of vegetables. Man cannot afford to rely on miffy, erratic species for his food. He must have food plants that are almost certain to grow when planted even under adversity. Because they will survive abuse, seedmen do not expect more than about one complaint for each ten thousand packets sold. He is amazed if he can hold complaints on flower seeds down to one for each two thousand packets. Actually, the reliable seed house maintains about the same standards of germination for both flower and vegetable seeds. I doubt that there are many seeds offered today testing less than eighty to ninety per cent. The only exceptions would be where a species produced non-fertile seeds which cannot be separated by regular methods from those with good embryos. Even these will test better than fifty per cent germination.

Why then does the amateur fail so frequently with flower seeds when his luck with vegetable seeds is above the average of success with living materials in other fields?

The answer is that flower seeds comprise a much more complex, heterogeneous mass of material. With but few

exceptions, vegetables originated between thirty and fifty North Latitude in Europe, a relatively narrow climatic zone. Hard-to-grow species fell out of use when they failed to produce a crop every growing year.

In the case of flower seeds, common, easy-to-grow species are still in demand. Zinnias and marigolds together outsell all the rest of the flowers in commerce. They do so because failure with these is all but impossible.

As the gardener gains experience, however, he demands more difficult species. He no longer wants small-flowered petunias, for instance; he demands the big doubles or giant fringed types that challenge the skill of the expert to grow well. He insists on trying to grow lupines in the Middle West, or even *Meconopsis baileyi* from the high Himalayas.

The unfortunate factor in this demand is the lack of knowledge behind seed growing. Failure is as disappointing to the seller as it is to the gardener. With no control over the actual growing operation, he is held responsible for the results of a delicate highly perishable product. I don't want you to think the following letter epitomizes the average customer, but it does show the type of reasoning sometimes applied. This concerns a packet of double petunias of the current crop, germination given by the grower as ninety-six per cent and actually testing ninety-eight per cent in our test room. Here's the letter:

"The petunia seed you sent me was no good. It didn't grow. I am seventy-six years old and have a low blood count. Can you help me?"

As silly as that letter is, it is no sillier than many I read. You'd be amazed

¹Condensed from a talk before the Men's Garden Club of America Convention, Boston, Massachusetts.

how few people realize there is any difference in the germination of various species. We get thousands of letters asking for help on failures with flower seeds, with no clue to how they were planted. They were planted, Period. They ought to grow.

This type of report has made me a good detective. By piecing together evidence, I can often come up with a guess as to what happened. For example, a woman wrote to complain that pansy seed she bought in January was no good. Planted in January, not a seed had sprouted by March. No information whatever on how it was planted.

Weather reports showed her area had dull, cloudy weather all spring. The letter was written on good paper from an impressive address. My guess was that she sowed the seed in a flat in a window and left it there. The house probably had thermostatically controlled heat, held within three or four degrees of seventy. No sun, hence even sunny windows never went above that temperature.

My analysis of the situation was correct. This told me exactly what was wrong. Pansies belong to the group of plants that need rather wide fluctuations in temperature to sprout—fifty degrees Fahrenheit at night and ninety during the day. At steady seventy, they just sulk. That is why we plant pansies in fall—natural temperature variation between night and day forces germination. Pansies *will* germinate with smaller variations, but steady temperatures stop them cold.

With this brief illustration of difficulties with germination, let's take a look at what is behind this process. It is perhaps the least understood of all life processes.

Inside the seed, mechanisms of checks and balances set up by nature permit survival during periods of adversity. These periods may be seasons

of cold or drought or lack of sunshine. This is what we would expect from a heterogeneous body of plant material that originated from as diverse regions as the tropics, the temperate zone and the sub-arctic. Each special mechanism served some purpose in its native habitat. Again, let's use the pansy as an example. Because fresh seed falling to the ground in midsummer might flower, go, to seed and die, the plant needed some mechanism to delay flowering until the following spring. For this reason, seed does not germinate until the cool days of late fall create the all-essential temperature variations.

If we insist on going contrary to nature in sowing seeds, we must compensate for this by artificial controls of temperature. For example, lettuce seed needs temperatures above forty-two but below fifty-five for good germination. If lettuce seed is sown in the Middle West in midsummer, most varieties fail to sprout. We can circumvent nature here by mixing our seed with damp sand and peat moss, and storing it in the refresher pan of the refrigerator. When it sprouts, the sand, peat and seed can all be sown at once. Annual larkspur and perennial delphinium also do best at the same temperature range, and can be germinated by the same methods.

Delphinium is often sown in the greenhouse in midwinter. Specialists have learned that if they want germination, they must open the ventilators on sunny days to keep temperatures down.

When we talk about optimum temperature, that doesn't mean some seedlings won't appear if the soil is too warm or too cold. There is tolerance in seeds, so that ten degrees one way or another may produce some seedlings. But the farther you get away from optimum temperatures, the poorer the results.

We used to sow delphinium seed under shade in late August. By keep-

ing off the sun, we could reduce soil temperatures sufficiently to get good germination. When we tried to grow in spring, temperatures were better, but we got no germination. Delphinium seed lost germination so rapidly as to be worthless.

Work by Dr. Barton at Boyce Thompson Institute of Plant Research, however, showed that delphinium seed kept under cold temperatures was just as good as fresh the next spring. Since then, we have built elaborate storage facilities for keeping a number of species of seeds over winter which will not retain viability at room temperature. Fine double petunias are among these. A good many of the failures with these can be traced to gardeners who order early, then keep the seeds on open shelves in a warm room.

We use low temperature storage with silica gel to reduce humidity. In dry cold, some tricky seeds have been kept viable for over ten years.

The problem of alternating dormancy is not so easy to solve. This involves a rhythmical pattern. It has been thoroughly explored in cabbage, a crop of high economic value, but the cost of doing the necessary work on the perennials which exhibit this mechanism would be far greater than the total value of the seeds sold.

Alternating dormancy means that fresh seed may sprout vigorously, but two or three months later seem dead. Wait six months and retest, and germination is way up. Six months later, down it goes again.

In the case of any perennial seed that doesn't sprout, yet stays firm and does not rot, suspect alternating dormancy. Don't discard the seed or flat. Wait a few months, preferably through one winter, and the chances are that it will grow. There are records of primrose seeds, for example, that showed no signs of life until the third spring after planting.

Unfortunately, we don't know what the trigger mechanism is for setting off germination in these seeds. If we had only one or two factors to check it would be easy. But when time, temperature, moisture, light and other factors may apply, any one of these in several combinations with the other, an experiment to determine the secret, would involve several thousands of experiments. Obviously, that is uneconomic and impractical for a perennial on which seed sales may not total fifty dollars a year.

Some species have what are called hard seeds. These are particularly common in sweet peas. These are alive and will grow if only we can force moisture through the hard seedcoat. In some instances, freezing is the only practical way to make them sprout. In others, fungi and bacteria have to digest the seed coat. An excellent example of this is *Aconitum fischeri*, one of the Monkshood species. We have never been able to get a test of this in the laboratory because we keep equipment sterile. We test it by running it cold and wet for weeks. If the seed doesn't break down internally, it's probably alive and will grow if soil bacteria attack the seed coat.

Some seeds are not fully mature when they drop from the plant. These seeds must be exposed to low temperatures (below forty-two degrees) but above freezing. Starch-to-sugar conversion and water viscosity are factors affecting this.

The role of light in seed germination is fascinating. Some seeds simply won't sprout if you give them any kind of a cover. Blue grass is an important example. One reason why bluegrass is slow to germinate is that most people rake it into the surface and the seed is not able to germinate until rain has washed away most of the cover.

Bluegrass is an example of another phase of germination which needs to be

understood. Most gardeners expect close to a hundred per cent germination. Yet, if even ten per cent of the bluegrass seed sown did germinate, they would be in trouble. Experts recommend sowing a pound to two hundred square feet, more than ten thousand seed to the square foot. Yet all we need for a good stand are forty plants to the square foot. Obviously, seeding under lawn conditions means high losses with low germination. We must sow thousands of seeds so that only a few will enjoy the optimum conditions favorable to germination.

A number of common seeds must have light for germination. Thyme, most of the grasses, the artemisias, endive, most (but not all) of the lettuces, achillea, gloxinia and all begonias are only a few of the species that come to mind.

Soluble salts and gases in the soil are also factors. Certain hard-to-keep seeds can be preserved practically indefinitely if immersed in an atmosphere of carbon dioxide. A tricky species like gerbera, for instance, can be kept for years if immersed in carbon dioxide at relatively low temperature, but will lose all germination in a few weeks on the open shelf.

Carbon dioxide can prevent seed germination in soil also. For example, a woman wrote us that we had sold her a bunch of junk. Her seeds had been planted under perfect conditions, generously fertilized, yet not one seed had even sprouted. She had put zinnias and larkspur in the same frame, along with a miscellaneous lot of material that simply couldn't be expected to grow under the same conditions, but she was sure that only the seed could be at fault.

In my reply, I pointed out that soluble salts in soil did have a harmful effect on seeds, and in high concentrations fertilizers would destroy seedlings before they could break through.

I got an indignant letter back stating that she was no fool: no chemical poisons for her. She had dug a five foot pit, filled in four feet of good cow manure and covered it with six inches of soil. Her seeds had been planted in that wonderful soil and had failed.

You can imagine that hotbed. Only a farmer injured by years of barn work to ammonia fumes could survive a whiff of it. Because carbon dioxide can't be detected by smell, there would be no way to identify it, but, if a CO₂ recorder were available, it would probably show a higher concentration than found in the chimney of a well-regulated oil burner. No gardener would think of running the fumes from his oil burner through a hotbed to heat it, but the fumes of fresh manure will do just as much harm.

The demand for "fresh seed" is universal. No one seems to realize that the seed sold in the spring of 1955 could not have been harvested that year, but came from the crops of 1954. There is a difference between freshly harvested seeds and those stored dry from fall until the following spring. Oddly enough, most of these differences are in favor of the older seed. This is only natural, since a seed is a storage mechanism, to allow survival for periods of as long as a hundred years.

Dry stored sweet alyssum seed, for example, germinates easily if a temperature of sixty-eight degrees is maintained. But if we sow fresh seed, it must first be chilled to forty-two degrees, then raised to sixty-eight. Then it sprouts in a hurry. A number of species display this same peculiarity, including antirrhinum, candytuft, carnation, dianthus, larkspur, lupine, *Phlox drummondii* (perennial phlox must be frozen), stocks and sweet peas. If you are saving your own fresh seed of any of these, be sure to give them cold treatment before sowing.

The Oregon Coast In Bloom

PHILIP M. POST

This narrative concerns itself with a comparatively small and idyllically beautiful section of the Oregon Coast in northern Tillamook County where Neahkahnie Mountain, a part of the Coastal Range, comes right down to the Pacific. Here rainfall is prodigious and because of geological differences the character of the vegetation is as varied as I have ever discovered in a similar area of perhaps eight square miles. My wife and I found it a veritable treasure chest of material for two such avid lovers of wild flowers as we are.

In February 1952 we moved into a cottage at Kah-Nie-Cliff, the John Schibel estate, where I was to be gardener. Immediately surrounding the cottage where we lived are scattered Sitka Spruces running into a heavily forested area below. To the north is deciduous alder woodland, and beyond that rugged treeless cliffs near the top of which not so many years ago engineers hewed the coastal highway. After the cliffs there is a perfect gem of rainforest where two sizeable creeks enter a story-book pirate cove with log strewn beach. Here giant Western Hemlocks up to nine feet in diameter, tall Spruces and Cedars of lesser proportions grow right to the water's edge. There is a tropical luxuriance in the profusion of ferns and undergrowth. I was astounded at the ways ferns and even shrubs become epiphytic on trees alive and dead, finding a roothold up to sixty feet in the air.

The Schibel estate is below the highway on the lower mountainside, and above it the Pacific slope is almost treeless beginning with grassland and running into tangles of Salal, *Gaultheria shallon*, a close cousin of our

eastern Wintergreen, about shoulder high, and mixed in places with Salmonberry, a raspberry relative. South of us near Manzanita, the Spruces give way to slim Lodgepole Pines which in turn are dwarfed to shrubs on the dunes along the shore for several miles.

I was then a New England expatriate (since happily returned to Massachusetts) so I can best talk about some of the things we found from February to July by comparing them to the wildlings with which I grew up. My wife is a native of Southern California but had lived in the state a number of years and had made a beginning at studying the Oregon flora. We pooled our resources on identification, she bearing the brunt of the bookwork. Our principal source of identification was Morton Peck's *A Manual of the Higher Plants of Oregon*.

Our very first discovery and one that particularly endeared itself to me was *Synthyris rotundifolia* already coming into bloom on February 20th. This member of the Figwort family is known as Roundleaf Kittentoes or Grouse Flower. It snuggles close to the earth among dead grass, leaves or even spruce needles for protection after the manner of our Eastern Hepatica, making sizeable many-crowned clumps, for its first venturesome blossoms are sometimes snowed under so early in the year. The finest display of this plant we found in open bent grass land between groups of Sitka Spruce where later wild strawberries with the biggest imaginable flowers, anemones, erythroniums, fritillarias and *Lilium columbianum* were to take over. These first brave little blue things aroused in my mind nostalgic memories of rock-

strewn open-wooded hillsides and the very earliest furry-stemmed Hepaticas in my native Massachusetts. Two plants I sent East have proved hardy for three years now and have increased considerably in size at Garden in the Woods near Framingham Center. They will stand some shade or full sun and dry summer conditions. I have some plants started at the Robert W. Stodards' in Worcester, where I am now the gardener, which tried to bloom in the fall, and I have hopes of naturalizing them on lightly, wooded, grassy slopes.

On March 16th we walked down to the beach road through a narrow horse pasture and found near the edge of alder woods *Viola glabella*, a stoloniferous yellow violet. In the woods were *Anemone oregana*, much like the Eastern *Anemone quinquefolia*, and clumps of Western Coltsfoot, *Petasites speciosa*. Near the beach road is a small bog which was spectacular with golden Western Skunk Cabbage, *Lysichitum americanum*. This aroid is many times larger than its more modest eastern cousin, a sunny, cheery sight, but it has the familiar aroma.

The next day we found great patches in the woods of *Montia sibirica*, Western Spring Beauty, and here and there *Dentaria tenella*, Oregon Toothwort, a cruciferous plant looking much more like the Eastern Spring Beauty.

The first week in April began with the most profuse branching purple violets I have ever seen, *Viola nephrophylla*, in the small field above our house, and in a far corner of the property the first of the large white Trilliums, *Trillium ovatum*, which later were many, showed color in beds of Wild Lily of the Valley, *Maianthemum bifolium*. Smith's Fairy Bells, *Disporum Smithi*, was next with flowers like Wild Oats borne after the manner of Solomon's Seal. On the 6th we found *Goodyera decipiens*, the west-

ern counterpart of Rattlesnake Plantain (not in bloom) in dense shade under Spruces, our first Oregon orchid. Pink Trout Lilies, *Erythronium revolutum*, began appearing here and there in the field near our compost piles, lovely flaring bells with mottled foliage. Near the old barn grew Fragrant Fringe Cup, *Tellima odorata*, modest in bloom but with a lovely perfume and foliage like the larger-leaved Heucheras to which it is related. A western botanist compares it to Trailing Arbutus in fragrance, but I insist that it is individual. I have one plant of it here and it seems perfectly at home in a garden.

By the 16th of April the Rice-Rooted Fritillarias had begun to bloom all over the place. They grow up to eighteen inches tall and have from one to eight chocolate and yellow bells on a stalk. The bulb is composed of rice-like scales, each scale capable of reproducing the plant. In the vegetable and cutting garden they became a nuisance. Later in May the same ground was dotted with the recurved, yellow, brown-spotted bells of *Lilium columbianum*.

About this time we identified *Polemonium carneum* growing in the long grass near our garage and below along the steep woodsy path to the barn. The flowers are apricot turning yellow and then pink. We concluded that pretty though it is, it would never make a garden plant as it needs surrounding growth for support.

In the greenhouse, a parasite, *Orobanche minor*, Clover Broom Rape, which has eastern family representatives in Cancer Root and Beech Drops, grew and bloomed on the roots of a potted geranium.

About May 10th the lovely Oregon Iris, *Iris tenax*, began to bloom on the outer fringes of the Neahkahn Golf Course property and later we found it all the way to the mountaintop. A

cousin, *Sisyrinchium bellum*, Western Blue-eyed Grass, grew in the floor of an empty water reservoir near the barn.

Part of the following I copy verbatim from my wife's diary. "May 25th was a day to remember forever. Despite my hayfever, we started to walk up the old road on Neahkahnie. Interest and the altitude did wonders for me, so we ended up at the summit! Way up the road and around the side of the mountain, we could look over Nehalem Bay and see the Nehalem River winding back into the hills. Farther up and around another side, we could look oceanward again toward Short Sands Beach. Then back a way before we cut across the slopes toward the ridge, following elk trails or going up and down through brush and over logs, finally up through tall woods and out onto the ridge where we had seen the elk grazing three days ago. Startled a deer who raced off around the mountain. Up the ridge to what we thought was the highest point, only to find a higher beyond, and a still higher beyond that. The mountain is certainly a razor-back! From the trail along the ridge the ground slopes steeply two ways, deep forest on the east and on the west, rock, brush and Salal. Just as we reached the highest point we disturbed eleven cow elk who retreated with much dust and rolling stones through the Salal. The wind was blowing like mad on top but we sat down just under the rim and were warm and cozy in a magnificent rock garden. The rocks, the flowers, the view of miles of coastline. And hundreds and hundreds of feet steep down, the highway and Kah-Nie-Cliff, and bright-colored specks on the golf courses. I really felt we were a thousand miles from anywhere. We live daily in the midst of a paradise such as people work and have all year to go for a vacation. We zigzagged down the face through

brush and rocks—rugged; and it took us a long time. We staggered into the house (*I* staggered, anyway) four and a half hours after we left, supremely happy, carrying a sack of slightly mangled specimens (from my falling on them a couple of times), Philip carrying a large bouquet of Larkspur and Paintbrush."

As we climbed we found *Dicentra formosa*, Pacific Bleeding Heart, in masses; a yellow Monkey Flower, *Mimulus guttatus*; *Smilacina racemosa*, much like our eastern False Solomon's Seal; *Violas nephrophylla* and *glabella*; and *Oxalis oregana*, a large-leaved, pale lavender species indigenous to forest floors and conifer needles.

On the ridge grew Wild Ginger, *Asarum caudatum*, and Bear Berry, *Arctostaphylos uva-ursi*, which seems to inhabit the whole breadth of this country. At the very summit the slope is of loose broken rock and every crevice seemed inhabited by some tiny plant trying to outdo all its neighbors with blossoms. There were clumps of Oregon Sunshine, *Eriophyllum lanata*, yellow daisies dwarfed to a few inches at this height; fiery Indian Paintbrush, *Castilleja angustifolia*; sheets of starry white Field Chickweed, *Cerastium arvense*; Fine-leaved Desert Parsley, *Lomatium utriculatum*, bright yellow with glaucous foliage; tiny blue *Collinsia pusilla*; a white Champion with grass-like tufts of leaves, *Silene oraria*; Nodding Onion, *Allium cernuum*; and a rich violet Penstemon, *Penstemon diffusus*. Just over the ridge toward the trees was what would later be an airy pink mass of *Lewisia rupicola*. Scattered over the same ground were quantities of plants of *Erythronium revolutum* from which I later gathered seed to send East.

On the descent we found a Western Foamflower, *Tiarella trifoliata*; Goatsbeard, *Aruncus sylvestris* var. *acuminatus*; Service Berry, *Amelanchier*

florida, not nearly as nice as our own *A. canadensis*; Wild Hollyhock, *Sidalcea hendersoni*; Ocean Spray, *Holodiscus discolor*; and quantities of a wild Larkspur which we never did identify.

European Foxgloves and Scotch Broom have spread like wildfire in Oregon. On the way to the dunes at Manzanita in June we passed masses of both and I thought if only the former would naturalize in New England as the Broom seems to be doing on the Coast! Our best memories of the dunes are of ruddy patches of the larger Indian Paintbrush, *Castilleja dixonii*; blue tangles of pea and lupin, and a lovely bright yellow fragrant Sand Verbena, *Abronia latifolia*.

On the brow of the cliffs just north of us, we found *Armeria maritima*, which of course I was familiar with as a rock garden plant, and *Erigeron glaucum*, Coast Fleabane, which bears blue daisies above neat rosettes in its native rocks but which I found becomes straggly in gardens.

In our dry reservoir I found the

only plants of the colorful *Mimulus decorus*, Tall Monkey Flower, that I saw. The leaves and blooms rise from mats of creeping stolons, so it is a true perennial. It thrived on almost nothing but stony subsoil and water which stood in stagnant pools.

Some of the plants I have spoken of have a wide range in the Northwest, others are limited to the area covered in this article, and a few, though I speak only of the location of first discovery, grew in other similar places in the area. There were many more natives that we found and identified, but these are the more interesting ones. We even found two plants that we were unable to classify. One I traced as far as the Portulacaceae, and I suspect that they have been missed by exploring botanists.

Here in Massachusetts my wife has gone a long way toward learning our natives, and will no doubt eventually be as keen about them as I am, but she has been slowed down by a vigorous young horticulturist, our two-year-old daughter, an Oregon expatriate.

Recent Advances in Horticulture

FREEMAN A. WEISS

Water

An "advance" may be a new or enlightened perspective no less than a concrete accomplishment. By this definition the thought expressed in the passage quoted below from Fairfield Osborn's Foreword to a recent book¹ by

Harold E. Thomas, of the United States Geological Survey, is an advance—perhaps even an advance in horticulture. Surely the importance of water in plant culture is incontestable.

Osborn says, "the people of our country, except those living in arid regions, have never had to think much about water supply. The combination of a fairly high average rainfall

¹The Convention of Ground Water. A Survey of the Present Ground Water Situation in the United States. By Harold E. Thomas. McGraw-Hill Book Co., Inc., New York, 1951.

throughout most of our continent, together with superb natural arteries of large inland rivers and lakes, have deluded us into believing that water is one resource about which we need have no concern." And again, "With the shock that comes from any new experience, about 40 million Americans, living in various regions and communities, are now realizing that they are face to face with problems of water supply. These problems are ones of either inadequate quantity, or unsatisfactory quality, or both."

This fact has been forcefully impressed upon many gardeners and plant growers who, in recent years and though living in traditionally humid regions of the country, have experienced critical and sometimes ruinous deficiencies of water for crop production. Interest in irrigation has mounted as a consequence, not because of regular need but as insurance against disastrous effects of drought of any duration. But irrigation systems do not come with built-in water supplies, any more than mousetraps with self-contained cheese could be found when the thrifty Scotsman went shopping for them. In fact, water sources of suitable capacity and quality, that are dependable in drought years, often proved very difficult to find.

The plantsmen may, however, take comfort in the thought that a similar problem confronts many industrial establishments, and even whole geographic districts, so that interest in this situation is now becoming a concern not only of various official agencies but of the educated public as well. On the other hand, the part that irrigation plays in creating the problem of ground-water depletion is also being recognized, and the whole situation is now seen to require conservation in its truest sense. This means not merely "water-saving" but implies coordinated planning in the development of water

resources and wisdom in their utilization.

What are the over-all facts in the ground-water situation and how do they affect our special interest in horticulture? As set forth in this book, the use of ground water in the United States about doubled between 1935 and 1950, a far greater proportionate increase than the total population showed, which took about 50 years to double. A much greater increase, too, than the per capita household use of water, though this has increased rapidly in recent years, especially in cities. The present rate of ground-water use is estimated at 25 to 30 billion gallons daily, of which irrigation accounts for 60 per cent, industry 20, and municipal water systems 12. Some of the areas now using ground water at rates greatly in excess of its replacement are important agricultural centers. The San Joaquin Valley in California is an example, where 40,000 irrigation wells pump about 7 million acre-feet² annually and the draft exceeds replacement by 1.5 million acre-feet, a 20 percent overload. In other areas, as at Baltimore, Maryland, and various places along the southeast Atlantic and Gulf coasts, the uncompensated draft on ground water for municipal and industrial use has resulted in salt-water encroachment from the ocean to a degree necessitating major engineering adjustments in water supplies. The water of some municipal systems already is unsuitable for irrigation, yet the alternative of using wells for this purpose is precarious because pumping from them leads to further salt-water encroachment. The statement is made that in parts of nearly every State, usually in urban or industrial areas, pumping from closely spaced wells has caused significant declines of the water table.

Thus irrigation already has discernible limits, and is often not the simple

²An acre-foot of water is about 325,000 gallons.

and expedient way of obtaining drought insurance that one might suppose.

Thomas presents a detailed analysis of ground-water resources, the problems attending their use, and the remedies for difficulties already encountered, in 70 selected areas distributed throughout the United States. Although the agricultural aspects of the problems are not especially stressed, plant-minded persons can find much information pertinent to their local interests in this presentation.³ From this extensive geographic sampling and from consideration of the ground-water situation as a whole, an encouraging conclusion is drawn, which can be stated by quoting Osborn once more. He says, "The over-all water supply is adequate for our nation, under all foreseeable future conditions, providing we inform ourselves fully regarding the facts and adopt programs through which the situation can be successfully dealt with."

No review, however brief, of water resources would be adequate without some reference to the progress that has been made by modern technology toward the realization of man's age-old dream of obtaining fresh water from the ocean. Fortunately there is at hand a recent book on this very subject.⁴ Like the survey first reviewed, this study also was sponsored by the Conservation Foundation.

The problem to which a solution was sought is how the sea water content of 35,000 parts per million of dissolved materials can be reduced to 1000 ppm, which is considered the maximum content of solutes in water intended for household use and for irrigation. Actu-

ally, even this is well above the salt content, especially of certain ions, such as Cl, which is believed suitable for permanent irrigation installations, though it is well within the range of salt concentrations in which plants are grown in solution cultures. Among the means by which elimination of excess solutes was attempted were pressure, heat, refrigeration; distillation, making use of heat from solar energy, from the depths of the earth, and from tidal power; chemical precipitation, and ion exchange. The principle of the last-named process is the one now employed in laboratory "deaminizers," and adaptable also to industrial use, for obtaining water of about the quality of distilled water but without the usual heating and condensing equipment. A resin filter is interposed between the source water and the product, which by passage of a low electric current is able to trap both positive and negative ions. In laboratory and industrial installations, the resin filters are periodically replaced, but they could also be renewed by flushing out the entrapped ions with fresh water. In the much more ambitious attempt to remove the vast excess of ions from sea water, the proposed procedure is to place a large number of parallel membranes between the plates of an electrolysis tank, with membranes passing only positive ions alternating with those passing only negative ions.

The authors believe that it should be possible within ten years, in areas where electric power costs are low, to extract water of 1000 ppm mineral content from sea water at a cost of about 30 cents per 1000 gallons. This is far above the practicable maximum cost for water in large irrigation systems, but it might be feasible for municipal water supplies. It could also furnish water at a practicable rate for hydroponic installations in situations where other water sources are not available.

³Those interested in more detailed statistics of water resources and utilization in particular localities should consult *U. S. Geological Survey Circular 114*, compiled by C. L. McGuinness, and published in 1951. Adapted from a report prepared for the President's Water Resources Policy Commission, it is the nearest approach to date to a national water resources inventory.

⁴*Fresh Water from the Ocean. For Cities, Industry, and Irrigation.* By Cecil B. Ellis and Staff Members of Nuclear Development Associates, Inc. The Ronald Press Co., New York, 1954.

Daffodil Breeding In South Carolina

MRS. BEN M. ROBERTSON

In the foothills of the Blue Ridge Mountains in Greenville County of South Carolina, I tend a small garden. For many years gardening has given me pleasure, but for the past fifteen years, since I have been hybridizing daffodils, it has become a most satisfying physical, mental and spiritual endeavor. There are those for whom this article will be repetition as daffodil breeding is fundamentally the same the world over. But to many it will be new and I hope it may encourage a few to try a hand at hybridizing, in order to sip just a little deeper from the wine of nature's cup.

Doffodil breeding is the production of new varieties by means of cross fertilization and seedling raising. Those who wish to grow seedlings should possess some good varieties, and from time to time add new ones from which they can hope to raise something still better. At first, the buying is done from necessity, then, as work progresses, one just buys. The patient assumes the happy attitude, "I am bitten by the bug and do not wish to recover."

When raising seedlings, there is seldom a dull moment. The heart of winter is the period of least activity, therefore much of the planning and dreaming of future work is done then. I search the catalogs in answer to the ever ready question of, "What new flowers shall I buy that will further my aims in seedling raising?" From the yearbooks, bulletins and catalogs, notes are made of all new crosses and are added to my own list kept in a permanent notebook for future reference.

As the first flowers begin to open, I revel in their beauty, feasting my hungry eyes to a portion of my soul's satis-

faction before hybridizing is started. When I "get my feet on the ground," so to speak, all tools with which I work are assembled in a large shoe box. A notebook has been prepared with double entries for most of the crosses to be made. For seed and pollen parents, only the best possible flowers are selected. Flowers are chosen for seed parents just as soon as they are well open. The anthers are immediately removed so as to prevent self pollination. As soon as a variety is open and the pollen is out, anthers are gathered with the tweezers according to the needs for pollen in the plan of crosses. Each variety is placed in an envelope, labeled and arranged upright alphabetically in the box. The box goes along to the seed parents for the crossings.

From the desired envelope, the anther is taken with the tweezers and gently brushed across the pistil of the de-anthered seed parent, making sure some pollen grains are deposited. As the pollen ages, it may fall from the anther into the envelope but can be picked up easily with an orange stick.

The double entry notebook looks like this for example: 'Beersheba' \times 'Eskimo'. 'Beersheba' being the seed parent and 'Eskimo' the pollen parent. The right hand entry is cut away from the book and covered with a strip of cellophane tape. This is looped around the stem of 'Beersheba,' allowing a little room for the expansion of the stem. The label will be legible until the seeds are gathered. The double entry book is extra work, but it can be done in advance and, since I do not employ a full-time gardener, any work done in advance is of great help.

At night when I settle down with my

records, the missing lines from the book of crosses give notes for a permanent record, from which I can check any time of the season for work that has been accomplished. Each day a careful survey is made of flowers as soon as I see them in the morning, and another just before dark. This enables me to detect any flowers that were missed and make plans accordingly. For weeks this goes on, with a pause now and then for interested visitors and frequent visits to the seedling beds to renew interest in plants of my own raising.

After the pollinating is done and the flowers have faded, with interest I watch the growth of the flower stems and the enlargement of the seed pods. Some of the pods will shrivel and die off, but most of them will enlarge their seeds and grow to maturity, when the pod will turn brownish. At this stage, they should be closely watched and picked before the seeds fall.

When mature, the pods are picked with a portion of the stem and the label that was made at the time of crossing. They are carefully opened, one at a time, and the number of seeds, along with the cross, are written on the envelope and placed in boxes to await planting.



De-anthered seed parent ready for pollinating.

In the field record book, the crosses are recorded alphabetically before planting starts, leaving space by each cross for the number of the row in the bed and the number of seeds planted. It is best to plant seeds as soon as possible after all are gathered.

The seed beds are in the open and have never been given any protection from the weather. Four years ago, when the thermometer dived to eleven degrees at Thanksgiving, which is most unusual in our climate, was the only time I have ever seen any damage to seeds. When germinated in this way, they grow very vigorously. No one near is growing seedlings, therefore I lack the opportunity of comparing re-



Pollen being placed on pistil of seed parent.

sults from another method in the same locality. Perhaps some day I shall pamper a few, for the sake of comparison.

The well drained seed bed consists of good garden soil with the addition of a little sand and humus. As soon as possible after the seeds are gathered, they are planted in rows about an inch apart and to a depth of one and a half or two inches. When the planting is finished, a mulch of ground corn cobs two inches



Fertilized seed pod about three weeks after cross was made.

thick is poured over the beds. This prevents weed growth, keeps the seeds moist and cool, and prevents rain from washing the seeds from the soil. There's nothing else to do now but wait for Spring and the tiny green shoots to come up, unless one is possessed by a keen sense of curiosity about the activity under the soil.

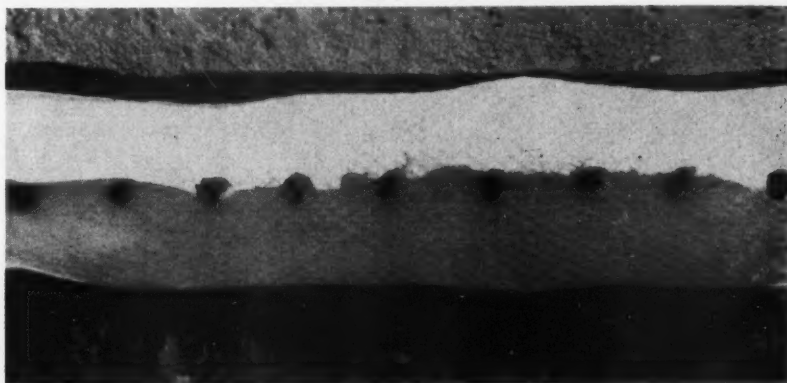
I shall always remember the thrill I had while on my knees by my first seed bed, when, after gently easing some soil from the row, I found a white shoot coming from the black shiny seed.

Other seeds had germinated for me, why seek a miracle in the daffodil? Perhaps it was because I realized the root would not only grow to sustain the plant, but it would also form a bulb, an entirely new bulb which would contain a secret. It would be a new flower, never seen before. It would be my own contribution, a mongrel, or perhaps something distinctive. Regardless of the final outcome, the anticipation of seeing my own flowers in bloom for the first time is the acme of gardening pleasure.

When all foliage of the seedlings is up, the mulch is removed and cultivation is started. The soil is kept loose and free from weeds at all times. Just before the foliage dies, a light sprinkle of bonemeal is scratched in and the mulch applied again. Other than watering during dry weather, the work is over for another year.

After the second year of growth, but before the foliage dies, the bulbs are moved to the field. They are planted at about the same depth and given the same treatment as large bulbs. In these beds they remain until all have flowered. Many will flower at four years of age, most of them at five, but some will be delayed. The first long wait will come only at the beginning. After the start in hybridizing, one does not

Mature seeds being planted in a furrow.



wish to let a season pass without making some crosses.

While the seedlings are flowering, any considered worthy of further trial are labeled. At the proper time they are removed and given a new bed for additional trial. Only a small percentage will show any improvement over their parents. That being nature's plan, it only serves as a challenge to another trial.

Second generation seedlings last spring produced some of the most brilliant red cups I have ever seen. They came from being crossed, after their first blooming, with each other, and by re-mating with some of the original parents from the following: 'Tinker,' 'Klingo,' 'Cornish Fire,' 'Rustum Pasha,' 'Chungking,' 'Dunkeld,' 'Magherally,' 'Carbineer,' 'Porthilly,' 'Forest Fire,' 'Indian Summer,' 'Rouge,' 'Tamino,' 'Market Merry,' 'Marksman' and 'Playboy.' All of these have vigor and good color. That being accepted, it seemed that before long flowers could

be obtained that would not fade in our very hot sun. Even in the second generation results are gratifying. My imagination goes wild with visions of seedlings two or three generations hence.

Although most of the white flowers grow beautifully here, on the whole we wish for them a little more vigor. Further breeding in this locale will be required to enable the whites to enjoy the happiness they display in colder, wetter climates. Some of the best growers here that are giving fine seedlings include 'Kanchenjunga,' 'Broughshane,' 'Trostan,' 'Eskimo,' 'Roxane,' 'Ardclinis,' 'Corinth,' 'Samite,' 'Tain,' 'Ada Finch' and 'Beersheba.'

So far, the largest portion of my work has been done in the classes mentioned above. Some hybridizing has been done in practically every class. Division II B is so large that an entirely separate paper could be written on it. Perhaps after a few more years I may be able to settle down and devote my attention to one type, if I can decide which I prefer.

Only fifteen years and fifteen thousand seedlings are not enough to allow mention of much in results. The whites come a little whiter, of longer and stronger stems, and with a little more vigor. The red cups are more brilliant and show remarkable resistance to our strong sun. Of course, all of these characteristics are influenced by the season. Perhaps after my third generation of seedlings, I may be able to better determine results in breeding from seasonal influence. Actual accomplishments are few, yet enough to hint at the results a prolonged breeding program in this climate could produce. It's enough encouragement to wish the other months away to see what each new spring has in store.

One could go on and on when writing of seedlings. It is not difficult to obtain fine flowers. That happens every

Seeds being germinated and are still attached.



*Narcissus 'Gladys Meadors'*¹*Narcissus 'Sunbeater'*

season. But it is quite another thing, and the aim of every breeder, to raise a flower of distinction. With the thousands of fine flowers now in commerce, a breeder must be up and doing to introduce flowers that will not be lost in the crowd. Even so, the adventure of seedling raising is so exciting, so full of dreams and anticipations, one seldom gives up. Who knows, next year could bring the super-flower!

Mr. Guy L. Wilson of North Ireland, outstanding raiser of white daffodils, has been a constant inspiration to me. His advice in obtaining a breeding stock of bulbs, suggestions for crosses and varieties to buy since 1940, have been valuable. Gardeners who love the whites have been blessed with his many

¹Named in honor of Mrs. P. D. Meadors, President, Garden Club of South Carolina, 1954-1956.

lovely creations.

Up to date, I have named only seven varieties. Thousands are still in the trial stage and a fair number look promising.

Promoting the daffodil in my locale has given me a wealth of friends and pleasure. The Greenville Garden Club, of which I am a member, has for the past six years staged an excellent competitive show in which the general public exhibits. Three years ago we added a division in which children are showing a great interest. Last spring entries exceeded five hundred, outside my educational display of seventy-five seedlings.

With interest in the flower running so high, I think before long others will be breeding daffodils in South Carolina.

Very interesting flowers have been obtained from the following crosses:

'Hebron' × 'Cornish Fire'—A flower with wide, somewhat pointed perianth of wonderful substance and deep gold color. The cup is short and of a deeper gold.
'Eskimo' × 'Kanchenjunga'—One of the loveliest flowers I've ever seen. The perianth is wide and overlapping and forms a lovely background for the pale cream trumpet which is very daintily tipped with a darker cream. The stem is a little short.

'Beersheba' × 'Kanchenjunga'—This flower resembles 'Cantatrice', opens whiter than 'Beersheba', and the formation and quality leave nothing to be desired. The stem could be a little longer.

'Fairy King' × 'Rustum Pasha'—The perianth is wider and not as pointed as that of 'Rustum Pasha,' and of a clear gold. The cup is flaring and a rich orange red that does not burn. The stem is tall and strong.

'John Evelyn' × 'Coverack Perfection'—From this cross, I am retaining two flowers—one with an orange-toned center; the other with a greenish-yellow blend. Both have very frilled cups and are especially liked by women.

'Royalist' × 'Trostan'—From this cross (in one year), I planted fifteen seeds. I brought eleven to flower. Five are exceptionally good and one is superb. This is a pale bi-color with very heavy waxen substance, well formed, and lasts an amazing length of time.

'Diotima' × 'Royalist'—From this cross, flowers are large and good looking, and some are very refined.

'Mitylene' × 'Mrs. R. O. Backhouse'—This cross gave one very lovely small, pale pink, cupped flower with a deeper frilled edge.

'St. Issey' × 'Cornish Fire'—Gives very smooth flowers. One is of excellent quality, gold perianth and a red goblet-shaped cup which is quite sunproof.

'Bread & Cheese' × 'Penrose'—From this mating came flowers with cups of a pinky-buff blend which are most unusual and very pleasing.

'Coverack Perfection' × 'Rustum Pasha'—A very cool-looking flower with a tint of chartreuse in the perianth. The cup is flushed with orange. An unusual flower and of good quality.

'Courage' × 'Kanchenjunga'—Many fine seedlings have been produced from this cross. One is especially good. Its perianth is more rounded than that of 'Courage,' it blooms earlier, and has a very tall stem.

'Magherally' × 'Tinker'—This cross has given so many beautiful flowers, it is hard to eliminate any. The best one is of velvety smooth texture, a gold perianth and intensely brilliant orange-red cup which does not fade at all in our strong sun. The stem is strong and of good length.

'Corinth' × 'Kanchenjunga'—This is another cross that produces smooth, well formed flowers. Good flowers come from both of these parents used either for seed or pollen.

'Green Island' × 'Chinese White'—produced a series of beautifully formed seedlings. One of these is of exceptional quality and is similar to 'Green Island,' although the cup is paler on opening.

All of the flowers just mentioned have been tested for a number of years and are proving to be strong growers. Some of them will soon be introduced.

All illustrations accompanying this article were prepared from photographs made by Mr. William B. Denton, Greenville, South Carolina.

Mrs. Robinson was winner of the National Council of State Garden Clubs' Purple Ribbon in 1954 for Creative Horticultural Achievement. Ed.

Kniphofia For Your Garden

PEGGIE SCHULZ

Kniphofia, Tritoma, Red-Hot Poker, Torch Lily, or Flame Flower, this African daylily relative is a brilliantly-colored, uniquely-shaped plant. Half-hardy, this perennial needs to be winterized in the North by lifting and storing the roots in a cool basement. In some sections of Philadelphia, it is hardy with winter covering; all the varieties and species are hardy as year-round outdoor plantings in the South and West.

Kniphofia with its great heads of autumn-toned red, yellow, and cream-colored flowers is easily incorporated in garden plans. A sheathed base of long, narrow, green leaves adds interest to the plants. Flower stalks vary in height from eighteen inches in *K. macowani* to seventy or more in *K. uvaria*, one of the most commonly grown. These plants are not fussy about soil. They do, however, prove more spectacular when grown in sandy loam or soil of a porous nature.

From Seed

Kniphofia seed is sold at most plant counters and generally you will get much flower variation from a pack. There are dealers here and in England who do list several different varieties. Don't be afraid to try some of the new ones—they are as easily grown and are far more beautiful than most of the commonly-grown ones. Sow the seeds in flats of sandy loam, cover with about one-fourth inch finely-sifted soil and set in a warm spot to germinate. A portion of the seeds will sprout in a week or ten days; others take a month or even more before showing their grasslike leaves. When the seedlings have four good leaves (about a month

old), prick them out and transplant to individual four-inch pots. As soon as danger of frost is over, set the seedlings directly into the garden. Space them eighteen inches apart in a sheltered, sunny location. A background of shrubs is much to their liking. You can count on flowers from all the strong seedlings the first fall; others will not favor you with bloom until the following summer or fall.

Greenhouse Culture

Kniphofias are easy to grow from seed or purchased roots in the greenhouse. Keep roots or plants at 45-50 degrees F. in the winter, 60-65 F. in the summer. Plant roots in eight- or ten inch pots of sandy, well-manured soil. Place in a sunny location and feed liquid fertilizer every other week. Seeds planted in February often bloom in July or August. If you want a beautiful show of color, buy some of the new hybrids. One dealer lists twelve species and varieties. Hautrouge, whose flowers first appear as red only to turn yellow when fully in bloom; Zululandi with its flaming red flowers; Sunburst, a stunning variety with brilliant light yellow, foot-long flower heads; or Vanilla, a dainty miniature variety with spikes of light yellow flowers, all make prize greenhouse material. In the greenhouse, older clumps must be kept fairly dry during the winter. A light watering once a month should suffice until early February when they show new leaves.

Kniphofias in the Garden

Like a great many other perennials, *Kniphofia* is most effective when massed in generous clumps. Space the

plants about two feet apart and do not divide the roots until they are three or four years old. They seem happy in any good garden soil. The flowers, each about an inch long, are packed tightly into cylindrical or conical eight- to twelve-inch spikes. Unlike hemerocallis or iris, these plants must not be left outdoors during northern winters. In the fall, dig the clumps and store them in sand in a cool 45-50 degree F. basement. Plant them out in the garden after the frost has left the ground.

I think Hemerocallis are good garden companions for them. Grow tall orange and red *K. uvaria* as a background for sixty-inch red-toned *Hemerocallis* Massasoit, forty-six-inch orange Desert Sunrise, or D. D. Wyman with its deep golden yellow, red-flecked petals.

If you like pastels, try *K. Northia*. On sixty-inch scapes, it produces great heads of rose and pale yellow flowers. At their best in August and September, they make good garden companions for the soft rose, hardy Aster 'Survivor,' salmon and yellow daylilies.

Imagine, too, creamy-white *K. multiflora* as a background for dark-red daylilies Black Magic, Garnet Robe, Morocco Red or Black Prince. This kniphofia flowers from early July until frost.

Nearly round, coral flowers appear on *K. coral* from midsummer until frost cuts them down. Intersperse this variety with Coral Bells, back it with brown-toned hemerocallis, such as Bagdad or Caprice, accentuate the foreground with blue platycodon, and you will have a border of charm and distinction.

For long-lasting garden beauty, plant clumps of Crown of Gold. This Torch lily starts flowering in June and does not close its clear lemon-yellow flowers until late September. Use it as a background for, or filler between, clumps of yellow, spidery-flowered *Hemerocallis* Kindly Light, fragrant yellow *H. flava* or greenish-yellow Limelight.

The dwarfs, such as *K. macowani* with its orange-red flowers, or Minette with its rusty-red flower spikes, are ideally suited to rock plants or front-of-the-border.

Cover Illustration

The Society wishes to express its sincere appreciation to Artist Allianora Rosse for her original conception of *Lilium candidum* appearing on the cover of this issue. Many of the readers will recognize Miss Rosse's brush from her excellent work in *Flower Grouer*, The Home Garden Magazine.

A Book Or Two

(Books noted "(Library)" are available for loan to the membership.)

A Treasury of American Gardening.

Edited by John R. Whiting. Flower Grower and Doubleday and Company, Inc., New York. 1955. Illustrated. \$7.50. (Library).

A truly modern garden book. It is concise and amply illustrated with fine photographs. Half of the chapters are very informative of garden principles and theories; the other half of the ten chapters is concerned with those who garden and why they garden. A small part of the book is concerned with the identifying characteristics and portraits of some trees. Another portion contains flower prints of the early 18th century.

The first chapter presents the history of garden writing in three and a half pages of text accompanied by two pages of illustration. Names and places are mentioned fleetingly; such names and places as would formerly require a full volume or more as an introduction.

T. H. Everett expresses his ideas on why thirty million Americans are interested in growing the many different types of plants about their homes. The subject is well treated through about one-fifth of the volume and on each odd numbered page of this section the reader will be delighted to see the full page illustrations of specimen plants, blooms and fronds. These photographs present superb detail and are a treasure in themselves, each of them representative of the plants identified with each of as many American plant societies.

Montague Free presents the theory of soil origin and the basic principles of soil management in a brief chapter.

The Furber prints are reproduced as a complete floral calendar. These prints are well known to modern garden enthusiasts who have visited Williamsburg in Virginia. They are presented as full page colored illustrations in this large volume. Reasonably good line detail is presented but the color process leaves much to be desired. On the facing pages the identifying key is copied in modern type. These prints are not American nor do they relate to American gardening of the early period before the Revolution.

A very interesting treatment of the more recent developments and trends in plant breeding is combined with a lesson in plant genetics and the reason why we can no longer find that old favorite sweet pea. The trends in annuals, perennials, shrubs and trees are described and many interesting results are recorded.

The next sixth of the volume is devoted to black and white illustrations of American gardens commencing with the Williamsburg reproduction gardens. All of these illustrations are excellent. Many of them portray beautiful garden areas which are thus preserved for all time for all to see in this compilation of landscape art. The gardens range from the formal to the naturalistic, and from the sumptuous to the simplest, with full page illustrations of nearly all of them.

Dr. Pirone presents a most interesting and comprehensive treatment of the chemical formulations developed in recent years for use in garden areas. Growth regulators, weed killers, plant hormones, growth-retarding chemicals, soil conditioners, plant foods and nutrition, insecticides, miticides, fungicides and the antibiotics are all very well identified in a few pages. This chapter is not for the gardener who has never experienced an infestation of spider mites or the myriad of pests and problems encountered in gardening. The partially informed gardener will be pleased with this additional information.

A chapter on kitchen gardening discusses many of the basic facts and presents four of the important requisites; sunshine, soil, time and equipment and materials. A selection of vegetables and varieties is included with variations for different areas of the country. Details of handling tender crops and controlling pests are briefly discussed.

A series of thirteen portraits of some of the more significant ornamental trees is illustrated in two tones and described briefly. Again the color is neither accurate nor pleasing.

The tenth and last chapter discusses the modern concept of gardening, that is, the garden clubs. Small groups of men and women disposed to participate in the mysteries of the plant world band together initially to discuss and resolve common problems. These clubs are now becoming an enormous power group which can deliver tremendous impact for or against an issue. Never before in history has there existed any comparable group in the garden field.

Robert B. Fisher, Horticulturist at Mount Vernon, Mount Vernon, Virginia.

House Plants For Every Window.

Dorothy H. Jenkins and Helen V. P. Wilson. M. Barrows & Company, Inc., New York. 1954. 238 pages, illustrated. \$2.95. (Library).

House Plants is a ninth printing of Dorothy Jenkins and Helen Van Pelt Wilson's popular book *Enjoy Your House Plants* which has been fully revised. The authors tell you how to grow all the popular as well as some of the lesser known house plants. Six colored pages, 11 black-and-whites as well as numerous drawings show many of these plants.

Especially good coverage is given African-violets, begonias, gardenias, spring bulbs, geraniums, cacti and orchids. Some three hundred more house plants are also expertly dealt with.

If you like to grow house plants you'll find this book a welcome addition to your library. It is the sort of garden book you will find use for the year round.

P. S.

Burrage on Vegetables.

Albert C. Burrage. D. Van Nostrand Company, Inc., New York. 1954. 208 pages, illustrated. \$4.50.

To the gourmet, the best reason for having a home vegetable garden is to be able to enjoy one's favorite vegetables at their finest. Next to the importance of quality, the author stresses a continuing supply of each vegetable desired, for as long as high quality can be maintained. Mr. Burrage has a large garden and a full-time gardener but he wastes no space or time on any vegetable that his family does not truly enjoy or that can be obtained commercially at a sufficiently high level of quality. Food values are not ignored but esthetic considerations are paramount.

The author makes no effort to induce others to grow and to eat the particular vegetables that he enjoys. On the contrary he encourages gardeners to follow their respective desires and work out their own best ways of realizing them. This book shows how one gourmet attains his desires, down to the final detail of cooking or serving each product as he likes it. Many may consider some of his cookery as too troublesome or at fault in some other way, but that is of little concern to him who grows, cooks and eats vegetables for the maximum pleasure he derives from them. Mr. Burrage stores, cans, or freezes only those products that can be so treated at home with a resultant quality that is superior to supplies otherwise available.

Part two of the book consists of one chapter each on 26 different vegetable crops, covering reasons for growing each, varieties, planting and harvesting schedules, amounts grown, cultural methods, pest and disease control, when and how harvested, preparation for eating, storing or preserving, and any noteworthy difficulties along the way.

Part three consists of five chapters on plant-growing structures and their use, mulching, gadgets, humus and compost, and pest and disease control. The last of these is less substantial and well documented than most other chapters in the book.

Part four contains tabulations of varieties, planting dates, lists of fertilizers and materials and related information derived from the author's experience with his own garden at Ipswich, Massachusetts.

Mr. Burrage's book illustrates the philosophy and principles he has followed in working out his own problems; he emphasizes that others must work out their own ways of attaining their desires in accord with their respective circumstances.

A final chapter is devoted to a "week-end minimum-effort garden," no match for the author's one-man full-time enterprise.

"Burrage on Vegetables" should appeal particularly to the suburbanite or country dweller who has resources for a medium-sized to large garden. The small gardener too, actual or prospective, may well be led to keener appreciation of the finer contributions that a home garden can provide in the mechanized, industrialized, commercialized environment in which we live.

Victor R. Boswell, Plant Industry Station, Beltsville, Maryland.

The Lily Yearbook of The North American Lily Society.

Edited by George L. Slate. Published for the Society at Geneva, New York, 1954. 144 pages, illustrated.

This is Number Seven in the series, and is particularly valuable as it contains the Cumulative Index of the four yearbooks published by The American Horticultural Society, and the yearbooks of The North American Lily Society from Vol. I (1947-48) through 6:1953.

Aside from this, it stands well in its own right, with a wide range of subjects treated from both amateur and professional levels, and from a delightful geographic range. The longest article comes from the well known Professor McWhorter who has dealt with lily troubles for many years and has written widely. Dr. Lawrence writes on The Naming of Lilies, and outlines for lily growers what they need to know in naming new varieties of their own creation, in order to have them in accord with the rules prepared by International Code of Botanical Nomenclature.

Short articles from New Zealand, Germany, Canada, Japan, as well as show reports make for wide interest. Several most useful articles from American growers are included as well. There is a charming memorial to the late Alice Eastwood, who died late in 1953 after a long life devoted to native plants, among them the lily.

The yearbook also carries advertising pages, which have their own particular value and allure.

B. Y. M.

The Hidden Life of Flowers.

R. H. Noailles. (Translated from the French text of J. M. Guilcher.) The Philosophical Library, New York. 1954. 93 pages, with over 100 illustrations from photographs by the translator. \$4.75. (Library).

This is a photographic story of the reproductive cycle of plants. The text is really secondary to the beautiful illustrations and, as such, is limited to explanatory notes. The purpose of such a photographic sequence story like this is to attempt to depict the marvelous details of the fundamental process of the life of a plant-reproduction, in a simple, visual language.

Accurate photography, accompanied by excellent art work and brief well chosen terminology makes this an easy approach to the intimate processes of pollination and fertilization. The illustrations are centered around the life story of the corn-poppy from bud to seed. Other plants, such as corn, barberry, and pine are used to demonstrate the role of wind and insects in this pattern of behavior. It is truly an absorbing manner of studying these intricate details without necessitating the use of laboratory equipment and, in perhaps an hour, one can visualize much of this unnoticed drama of one of the most absorbing principles of biology.

J. L. C.

The Flowering Cactus.

Avery Carlson and R. C. and C. M. Proctor. \$7.50. McGraw-Hill Book Company, New York. 1954. 96 pages, 34 black and white and 81 color illustrations. \$8.00.

Cactus flowers have such silky texture and brilliant color that black and white pictures, even when supplemented by verbal descriptions, are incapable of producing an adequate presentation to the reader.

Ever since the introduction of Cactus to Europe, after the discovery of America, the need for color illustration of the flowers was recognized and from 1904 to 1921, 180 color plates were issued by Schumann Gürke and Vaupel under the title *Blühende Kakteen* and these plates were bound in three volumes. One set recently offered by a used book dealer in Europe brought 480 Guilders (about \$126).

These plates were printed from photographs and overprinted in 3 colors of ink. They were not good color presentations.

From 1931 to 1937, Dr. Eric von Werdermann issued 168 color plates of Cactus and other Succulent Plants for later binding. These were fairly good color pictures but were far from true color and in addition they were quite expensive.

Therefore *The Flowering Cactus* edited by R. C. Carlson, and including 81 color plates by the well known R. C. and Claire Meyer Proctor, will find a warm welcome from every lover of beautiful flowers and especially by cactophiles.

The book is cloth bound $11\frac{1}{2}'' \times 8\frac{1}{4}''$ and many of the color plates occupy the full page. The high gloss paper brings out the gorgeous color and suggests the silky texture of the flower plates.

The plates are all captioned with the common name of the plant illustrated and the scientific name is also given, although in a few instances the scientific names given are inaccurate.

In addition, there are 34 black and white illustrations and some line drawings by George Avey who also designed the book.

The well written text, which covers the habitat of the plants, some interesting comments on their physiology, not necessarily accurate, and the directions for their culture and hints to photographers make the plates more valuable.

The Flowering Cactus is the best presentation in color ever attempted of this interesting plant family and certainly the most accurate reproduction of the colors of the flowers.

The Proctors are recognized as outstanding photographers of desert plants and their work has appeared in *Arizona Highways Magazine* and in many of the leading magazines in both America and in Europe. In addition, both are keen students of the Cacti and experienced growers of them.

Raymond Carlson, who edited *The Flowering Cactus* is the editor of *Arizona Highways Magazine* published by the Highway Commission of Arizona to further the interest in that State.

W. Taylor Marshall, Director, Desert Botanical Garden, Tempe, Arizona.

Stray Feathers From A Bird Man's Desk.

Austin L. Rand. Doubleday & Company, Inc., Garden City, New York. 1955. 224 pages, with entertaining cartoons. \$3.75. (Library).

It is indeed a difficult task in this brief review to pass up a single chapter of this volume which is a veritable merry-go-round for bird lovers everywhere. Dr. Rand has had many years of research in the Chicago and New York Museums added to his wide travels to the far corners of the earth. In a highly delightful and informative way he has shared with those of us less favored in ornithological travels and minute observations his wonderful experience.

The reader even of the most sedate and serious mind could not fail to become wide awake and enthusiastic over the very clever cartoons heading every chapter, all so descriptive are they of the strange and curious phases of bird life mentioned in the texts.

One of the most interesting of the observations recorded covers the feeding habits which are legion and as individual as we who are human. Did we dream that gulls pick up shellfish on the coast line, drop them on rocks or even hard roads to break the shell to get the food? In North Africa large vultures feast on turtles, carrying the victim high into the air, dropping it with violence to crack the shell. Gulls and crows do likewise.

The characteristics of birds are so well covered in the pages of this volume, curiosity, building of the nests to their fancy, bird bathing, and many other humanlike fancies. Protection from danger and attack is noted. Petty thieving by starlings and common sparrows also is shown. Some birds even wash their food. Dr. Rand considers owls stupid.

This review would be far from complete without some of the fine observations on selection and building of nests. "Interior decorating" is not confined to human beings, the bower bird of Australia decorates her nest with shells, feathers, bits of bone, and fruit, crushing the fruit for juice with which to adorn her nest with color. Swifts use the saliva to glue their nests to a wall. Barn swallows have even nested on railway trains, raising their young in the box cars. The hornbill so constructs the nest that a narrow slit is left for feeding. Then too, man is not the only creature to occupy apartment houses, purple martins too occupy apartment houses with dozens of rooms. To this writer who has reveled in the observations of the building of nests of many of our local birds near the Nation's Capital, Dr. Rand's interesting phases of this subject are of marvelous interest.

The weaving performed by our own Baltimore oriole is fascinating as told by the author and personally observed by this writer, the fibers so deftly pulled back and forth by the bill; the weaver bird, with its short and clumsy bill excelling the oriole by weaving a tube for an entrance to the beautifully woven nest attached to a limb by fibers. He further tells of the "tailoring" of birds by sewing leaves together with cobweb threads.

Birds have strange habits. Monkey birds, so

named from the habit of following the monkeys closely as they hop about, hornbills, shrikes, also fairy bluebirds, feast on the insects scared up by the incessant hopping of the monkeys, these creatures unknowingly providing food for the birds. That is unconscious cooperation. Among the strange habits of our feathered friends, Dr. Rand gives a fine picture of the eider ducks which have only one mother until the young are turned loose to just anybody's mother.

One cannot read Dr. Rand's superlative volume without recognition of the high quality of research through the years and his acute observations in real bird life. Whatever may be your vocation in life, you would find wonderful relaxation in the pages of this delightful book, not one chapter but which makes one wonder about the fascinating side of bird life, so little known to so many of us; the most readable book to come to the public for many years. There is not a dull page in it. I commend it to those needing relaxation and entertainment, and knowledge of our bird population.

Mary G. Van Meter, Washington, D. C.

Studies in Penstemon No. 2, The Subgenus Dasanthera (The Shrubbery Penstemons).

Ralph W. Bennett, American Penstemon Society, 5607 North Twenty-second Street, Arlington 5, Virginia. 1954. 86 pages, mimeographed. \$2.00. (Library).

The horticultural practices, diseases (their treatment), distribution, and taxonomy of eight species and the various subspecies comprising this group are presented in this work by Dr. Bennett.

Details of taxonomy and distribution (including individual garden locations) may be found in the long key, in the species descriptions and in several other places in the text resulting in a full treatment. A short key dealing only with taxonomic differences is included as is a two-page review of these differences, preceding this short key.

A complete review of the climatic and edaphic requirements of the group and their variations in different portions of their range is likewise presented including many notes on specific behaviors in individual gardens.

The author suggests certain interesting treatments that might increase the southward range of the "Woolly Penstemons", at least under cultivation.

There are definitive line drawings of sepal shapes, leaf shapes, leaf edges and tips, as well as one interpretation of the corolla structure in *Dasanthera*. The other interpretation, though no more correct, is equally common and perhaps was worth inclusion. Another drawings are also found on the same page as all the other drawings; a happy placement of all the illustrations.

Because of its detailed account, this statement will serve the interested gardener as a reference work.

G. Edwin, Plant Industry Station, Beltsville, Maryland.

Geraniums.

Derek Clifford. John de Graff, Inc., New York. 1954. 80 pages, illustrated. \$2.00 cloth; \$1.00 paper. (Library).

Because this is an English edition, written for the culture of geraniums in England, one should take into consideration that in many parts of the United States, geraniums would be handled quite differently in accordance with the climate. The general culture of geraniums is, however, the same, be it Florida, Alaska, or England.

This is a real down to earth book. Mr. Clifford does not waste any time with flowery words of introduction nor a long detailed report of the history of his subject. He starts right off to tell from first hand experience all about how to grow geraniums (*Pelargoniums*) for pleasure, show purposes, garden display, in greenhouses, in window boxes. One needs only to read a few pages to know that the writer knows his subject and has had years of experience.

Mr. Clifford very nicely covers the different characteristics of all the different groups of geraniums. He does not, however, attempt to name all the different varieties known to be in cultivation. This, he informs us, would be a list of over 700 names. He consequently warns against trying to grow all the varieties one can obtain; rather grow a few of the best and most suitable varieties for your location. He has listed only a few of the more outstanding varieties in each group.

In the double and single blooming groups, very few of the varieties recommended are to be found listed in American catalogues. This is because in recent years, due to wars and importation restrictions, there has been very little exchange of plant material between the two countries. As a consequence, new and improved varieties have taken the place of old ones in both countries, resulting in many instances in their being identical but with different names. For instance, by the illustration and description of 'Skelly's Pride,' it is quite evident that it is the same as the one we grow here in America as 'Jeanne' or 'Sweet William.' Likewise, the variety 'Attraction' is certainly not the fancy-leaved type we have as 'Attraction,' but is, in all probability, our 'Pink Poinsetti.' And so it will go with a great many of the varieties listed. Both English and American growers agree that many varieties grown here and in England are the same but listed under different names.

In the fancy-leaved group and scented group, fortunately, fewer new varieties have been introduced in recent years, so the names of these in the two countries are mostly the same.

I consider this a most worthwhile book and highly recommend it to all growers and lovers of geraniums.

Mary Ellen Ross, Merry Gardens, Camden, Maine.

Soil.

G. V. Jacks. Philosophical Library Inc., New York. 1954. 221 pages. \$8.75. (Library).

Soil is a good title for this book by G. V. Jacks of the Commonwealth Bureau of Soil Science, England. It has many features of a conventional textbook on soils, but with important variations. For the most part it is general in its application, although in certain respects it is devoted specifically to Great Britain.

"Soil is what plants grow in." This simple definition is in contrast to another more lengthy one for humus: "When all the plants and animals and microorganisms have eaten and digested each other until they can get nothing more out of each other, what is left is known as humus."

The two chapters on soil population deserve particular attention. The cockroach, the ant and the earthworm join with many other organisms having an influence on soil properties.

One of the distinctive features of the book is the chapter entitled *The History of British Soils*. The main events of agricultural history, so far as they concern soils, are: Open-field farming, based on the feudal manor; The Black Death; Rise of wool trade; The Tudor enclosures; Introduction of clovers and root-crops; Land reclamation; The industrial revolution, leading to further enclosures; and Invention of artificial fertilizers.

British soils are described as dominantly formed under deciduous forest which was the natural climax vegetation of much of the country. The author has come forth with an interesting book with subject matter clearly presented. Many laymen interested in a better understanding of soils will find this book informative.

M. S. Anderson, Plant Industry Station, Beltsville, Maryland.

camellia growers need to know about. There are pictures and descriptions of the different kinds of camellia leaves including size, shape, color and other characteristics of the leaves of the different cultivars. There's a splendid write-up on the camellia fruit and instructions on how to handle and plant the seed.

The section on planting the bush with proper emphasis on the danger of planting too deep should be of very great value to beginners. Methods of watering, hardening off plants for winter, value of mulching, time to apply as well as a discussion of mulching materials are all handled in the same thorough manner as the other items discussed.

The three color plates plus the 249 black and white plates of the same number of cultivars described and illustrated in alphabetical order from 'Adolphe Audusson' to 'Yohei-Shiro' make this one of the most beautiful books on camellias. There is ample information on each of the 249 cultivars described including a description of the plant, the leaves, the flower and the time of flowering, i.e. early, medium, or late, followed by a full page of an almost natural size picture of the flower. And when I say picture, I mean the last word in excellent photography because that is what it is. Naturally it would have enhanced the value of this volume to have had these pictures in color but that would have run the cost of the book beyond the reach of the many who will want it either for their personal use or for their community garden club library. This is a book recording years of actual experience that should help beginners get started in the right way as well as one that all can use to advantage in the production of the camellia which because of its outstanding beauty is growing in popularity and spreading in all directions from its long time home in the heart of the "old" South.

Frank L. Teuton, U. S. Department of Agriculture, Washington, D. C.

Camellias in the Huntington Gardens.

William Hertrich, Curator Emeritus. Abbey San Encino Press, Pasadena, California. 1954. 380 pages, illustrated. \$10.00 (Library).

First of probably three volumes which, when finished, will contain a delightful, constructive, and generous description of the more than 1,000 cultivars (or varieties) of camellias now growing in the Huntington Botanical Gardens at San Marino, Los Angeles County, California.

This is easily one of the finest, most informative and most valuable books published thus far on camellias. The discussion in this volume is mostly on *Camellia japonica* but there are references to *C. sasanqua* as well as the new *C. reticulata* both of which are scheduled for complete discussions in later volumes. This first volume is divided into three main parts and contains much practical information of use to beginners, as well as sections that will be of interest to experienced growers on history, climate, culture, propagation, flower form, diseases, fertilizers, color code, and many other things

Perennials In A Bishop's Garden.

Lydia Marshall Green. Dorrance and Company, Inc. Philadelphia. 1953. 161 pages. \$3.00. (Library).

As stated by the author, "The purpose of my book is to aid the beginner in selecting the best material available for his Perennial Garden and to get results with them by becoming familiar with their requirements."

The arrangement is by plant family, genus, species and variety, with the common name when one is in general use. In most instances the species or variety is described as to flower color, requirements as to soil type, exposure to sun or shade, time of bloom, height of plant, size of flower and manner of propagation.

All the plants discussed have been grown by the author and information regarding them was obtained from day by day living with them and watching them develop as the season progressed.

This book will be useful to all gardeners who are planning a perennial garden and who seek information regarding this interesting group of plants. It must be pointed out, however, that the information regarding growth habits, and time of flowering is for a location in eastern Pennsylvania and will not be typical for many other sections of our country. By comparison, however, with known blooming dates of some species in any locality, one could fairly well determine the flowering period of the others included by the author.

S. L. Emsweller, U. S. Department of Agriculture, Beltsville, Maryland.

The Improved Nut Trees of North America, And How To Grow Them.

Clarence A. Reed and John Davidson. The Devin-Adair Company, New York. 1954. 404 pages, illustrated. \$6.00.

For forty years Clarence A. Reed was Associate Pomologist and Specialist in Nut Tree Investigations for the Bureau of Plant Industry, U. S. Department of Agriculture. Following his retirement in 1947, he set himself to the task of preparing his findings for publication, based on the vast data he had assembled during his years of service. The work was halted by his untimely death in 1950.

The completion of the work has been accomplished through the cooperation of his friend John Davidson, a capable writer and skilled artist. Each had been President of The Northern Nut Growers Association; both were well acquainted with the leading scientists and experimenters in the field. Though ardent nut culturists, neither permitted his enthusiasm to interfere with his fidelity to fact.

Much of the writing and all of the illustrations are from the pen of Mr. Davidson. When the task had been completed tragedy struck again. A few weeks before publication Mr. Davidson, too, passed away.

The book is pleasant reading and highly authentic. It deals both with the nuts native to America and with those exotic species that have become acclimated here. Commercial aspects of nut growing are conservatively treated, facts and figures being given for those species that are grown for market.

Such matters as sites and soils for commercial orchards are given consideration. Selection of varieties, spacing, planting, care and cultivation of the orchard, all receive due attention. Diseases and insect pests and their control are discussed. Crop yields, harvesting, curing and marketing are dealt with in some detail. The high nutritive value of nuts is tabulated.

It is the possibilities of nut trees for home

grounds that awaken the highest enthusiasm of the authors. There is probably no section of the country where some species of nut tree cannot be grown. Among their species, from the lowly chinkapin to the majestic pecan, can be found the finest of trees for every location and purpose, whether for shade, beauty or food.

Amateurs who like to work from the ground up will find detailed instructions as to propagation, from planting of the seed to layering, budding, grafting and transplanting.

With this book any one with soil, sunshine and the will to work can grow nut trees.

The Improved Nut Trees of America will doubtless become a standard work in its field.

H. F. Stoke, Roanoke, Virginia.

Washington Daffodil Society Yearbook, 1955.

36 pages. Washington Daffodil Society, 5031 Reno Road, N.W., Washington 8, D. C. Price 50 cents.

Daffodil growers in both plain and fancy categories will welcome the return of a Daffodil Yearbook to the American scene. The 1955 version is not a lineal descendant of the series of daffodil yearbooks issued by the American Horticultural Society from 1936 to 1938, but there is a degree of consanguinity. Mrs. George D. Watrous, Jr., who has conducted the daffodil column in this magazine, together with Mrs. John S. Moats, are the editors of the present yearbook, and several of the individual contributors are represented in both the former and present volumes. The influence of the Maryland-Virginia district predominates in the selection of material but it must be noted that this is both a representative and a very successful region of daffodil culture, and the listing in this book of The Best Daffodils of 1954 could not have been done more authoritatively by any group of growers in this country. The tabular presentation, showing at a glance the flower type, season, and rating, is most helpful. This list, and its companion "Economy List" of Fine Up-to-date Daffodils, would perhaps constitute a valid claim of this volume to the title of American Daffodil Yearbook, but there are also articles of national scope on the breeding of redcup daffodils by Grant Mitsch, on the characteristics and classification of miniature daffodils by Roberta Watrous, and on novel methods of growing and propagating daffodils by Serena Bridges, as well as articles on a range of other daffodil subjects. A tidy and informative little volume. F.A.W.

The Gardeners' Pocketbook

The Fundamentals of Pruning

Perhaps any discussion of the fundamentals of pruning should be preceded with a definition of the term. One such definition of pruning might be "the removal of wood that is dead, diseased or no longer needed so that additional energy will be available to those parts of the plant that best fulfill the requirements of a particular situation."

If the definition is analyzed, it is apparent that it includes the removal of dead and diseased wood, a popular conception of the need for pruning. It includes the removal of weak wood. This might mean the weak, spindly twigs on a rose bush or the small, weak twiggy growth in the inner part of a tree head. In neither case, or others that are similar, is this type of growth important. Its removal will divert more energy to the growing points that are needed.

The definition would include early corrective pruning, so necessary in trees, in order that later heavy pruning, weak crotches, and cavity treatment can be avoided. It would include pruning for highly colored leaves, better flowers and fruits.

Pruning is a corrective and a maintenance practice. It is probable that under present labor conditions not much money is made in shrub pruning as a maintenance practice. Therefore, it becomes increasingly important to select plants that fit the situation in which they will be used. Don't use shrubs or evergreens that must be continually cut to keep them at the size desired. Don't select plants, unless they possess some outstanding characteristic that cannot be obtained in other plants, that require the continual removal of a lot of dead or weak wood as is true with most of the species of *Lonicera* and *Spiraea*. Plantsmen and landscape gardeners

can do you a lot of good by better plant selection.

The response of plants to pruning is largely twofold. While there is an increase in vigor, pruning is a dwarfing process. Dwarfing comes about by the wood that is cut away, by the reduction of the leaf surface, thus reducing the amount of food manufactured by the leaves, and by reduction of root growth. Some experimental work has shown that top pruning may reduce root growth even more than it does top growth. It has been reported that small unpruned fruit trees were thirty-three per cent larger than pruned trees even after five years. After ten years, the unpruned trees were still seven per cent larger than pruned trees.

The increase in vigor following pruning is typical of both young and old plants, but most pronounced with old plants. The extent of the increase in vigor is practically dependent upon the time of year the pruning is done. Reasons for the increase in vigor following pruning include the increase in water supply to a more limited number of growing points, increased efficiency in conduction of water and mineral nutrients, a change in the carbohydrate-nitrogen relationship favoring a higher nitrogen ratio, and reduction of flower buds which conserves energy for the remaining growing points.

An important factor to consider in pruning is the response of plants to pruning at different seasons of the year. This response is dependent upon such features as the amount of stored food in the plant, the movement of the stored food and the foliage retained for further photosynthesis.

While there is only a limited amount of research to support the statements, it is probable that for many plants

stored food is at a maximum in the autumn or about the time of leaf fall. Food storage starts by mid-summer with continual accumulation up to mid-October or a little later. This food accumulation is mostly in the form of starch. Sugars increase sharply throughout the plant between the middle of October and the end of December. A second peak in accumulation of carbohydrates in the plant occurs in March and April.

If these statements are correct and it is desirable to prune when as little dwarfing as possible will result, it would seem that pruning should be done in late winter. This pruning before start of growth in the spring will result in the least loss of stored food. Some work with fruit trees has shown that during the latter part of the dormant period, one-third to one-half of the nitrogen and large quantities of the reserve carbohydrates are in the roots.

Undoubtedly, not all the pruning can or should be done at this most favorable time of the year. This being true, pruning at the most favorable time could be restricted to particularly valuable plants, weak plants, tender plants, and plants slow to respond to pruning and wound healing where high food reserves would be important.

Heavy fall pruning may result in winter injury. Fall pruning causes a reduction of food reserves, delays maturity, and inhibits normal root growth. Ample leaf surface throughout the fall season is imperative to maturity, hardiness, or the maintenance of a satisfactory condition if stored over winter. Heavy fall pruning may result in weak growth the following spring and summer, little accumulation of food reserves, and a weak, tender condition during the next winter. Considerable pruning during late spring or early summer, after the flush of growth, will result in the greatest dwarfing effect from pruning. Fall maturity may be

considerably delayed or impaired by pruning at this time.

Some top pruning is a common practice at the time of transplanting. It is often expressed that the top should be reduced to balance the loss of roots resulting from digging. A better practice to follow is to prune the top in accordance with the ability of the roots to function. If the plant is in good condition when received and, if following planting in good soil, will be given good maintenance, that plant will not require as extensive top pruning as a plant received in poor condition, either because of poor storage conditions or drying in transit, or one that is poorly planted or maintained. Plants transplanted out of season will require more extensive pruning than ones planted during a more favorable season. Pruning at transplanting should be done with the policy in mind of leaving as much wood on the plant as possible, this to support good leaf surface and to favor manufacture of food reserves. Ample food manufacture will favor production of better root recovery and growth.

A few points might be mentioned relative to pruning practices followed with the production and maintenance of different groups of plants.

With evergreens, more corrective pruning should be done in the nursery. The development of a good body plant, avoiding legginess, and the removal of multiple leaders in upright types are important practices. The question is frequently raised whether it is better with evergreens, especially the upright types, to develop the body of the plant first and then get height or to reverse the procedure. It would seem to me that it is better to develop the body of the plant first and then get the height if the best type of plant is to be grown. It is difficult to develop a good body on a plant that has been pruned in such a way that early development has been confined primarily to height.

Pruning to develop a well-shaped evergreen will require more than one pruning a year when the plants are small. Shearing two or three times a year will be desirable. Pruning once a year, previous to growth in the spring, is often all that is required to maintain established evergreens in landscape plantings in good condition. In established plantings, attention should be given to removal or restriction of multiple leaders of upright growing types and to keep the top branches on the wide spreading forms. This restriction will give better light to the lower branches and overcome the tendency of legginess with age.

Research practices of storage and pruning of roses have shown that pruning previous to storage or at planting in the spring should be less severe than frequently practiced. With vigorous growing rose varieties, cutting the canes back to less than ten inches when they were placed in storage reduced bloom the following year. Canes on these vigorous varieties could be cut back to six inches when planted out in the spring without reducing bloom. With weak varieties reduction of cane length either when the roses were put in storage or planted out in the spring reduced bloom production the following year. Delay the pruning of established roses until spring.

Pruning practice to follow with old, overgrown shrubs is often a perplexing problem. Three practices can be followed: The most drastic but often the most logical and effective—and no more expensive in the end—is to remove and plant more suitable shrubs. Old, overgrown shrubs can be cut to ground and a few of the new strong shoots selected and pruned to develop the new top. The third practice would be to follow a gradual renewal system wherein a few of the older stems or shoots are removed each year and a few new ones left to develop. This prac-

tice, however, should be started before the plant becomes overgrown. Pruning in respect to the flowering period is often stressed. Where extensive pruning is necessary, the pruning can be done during the dormant season before growth starts, regardless of the flowering period of the plants pruned. Shrubs that are heavily pruned will give little bloom for one year. If pruning is done after bloom, there will be little the next year. If they are pruned during the late winter or early spring before growth, the flowers of the current year will be sacrificed but the dwarfing effect of the pruning will be less severe than if done after flowering, and the plants will recover to produce some bloom the following year.

Early corrective pruning of trees in the nursery, and while they are small in landscape plantings, is important. Early corrective pruning makes it possible to make small cuts which will heal quickly and to select proper branches to make a good top. Early corrective pruning will avoid the development of weak crotches and will overcome much of the need for cabling, bracing and cavity work often necessary in old, poorly-pruned trees. A good practice is to prune for strength in trees.

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L. C. Chadwick, Professor of Horticulture, Ohio State University, Department of Horticulture and Forestry, Columbus, Ohio.

Columnae crassifolia—The Correct Name for *Columnae stenophylla*

In the July 1954 issue of THE NATIONAL HORTICULTURAL MAGAZINE (Vol. 33, pp. 212-215), the author published an article on the showy *Columna stenophylla*. Dr. H. Emery Moore, Jr., of the Bailey Hortorium, who is engaged in a study of the cultivated

gesneriads, kindly called my attention to a color plate (Pl. 4330) of *Columnea crassifolia* published in Hooker's *Botanical Magazine* (Vol. 73) in 1847. The resemblance between *C. crassifolia* and *C. stenophylla* is at once obvious. The only obstacle in the way of accepting the name *C. crassifolia* was with reference to the original description of *C. crassifolia*, in which the calyx lobes are described as being glabrous, whereas those in *C. stenophylla* are definitely covered with hairs.

In order to settle the matter, Dr. N. Y. Sandwith of the Royal Botanic Gardens at Kew kindly offered, at Dr. Moore's request, to examine the original specimen upon which the description of *C. crassifolia* was based, especially with reference to the glabry of the calyx. Doctor Sandwith's careful study of this historical type specimen revealed that there were, indeed, hairs on the calyx, indicating that the original description of *C. crassifolia* was in error. Except for this discrepancy, all the other characters of *C. crassifolia* were found to be exactly the same as those of *C. stenophylla*. With this point now settled, there is no argument as to the proper name of the plant, since *C. crassifolia* is the first legitimate name published, almost eighty years prior to the publication of *C. stenophylla*.

At the time *C. crassifolia* was published, the exact country from which the original plant was collected was not known, but Mexico was thought to be its probable native land. Quoting from the original description in 1847, the following is given: "This is the largest flowered and most beautiful of this beautiful genus, of which I regret that I know nothing more concerning its history than that it was sent to us by Mr. Makoy of Liège under the name of *Columnea crassifolia*; which appellation being unexceptionable, I gladly adopt. It is probably a native of

Mexico, and extremely different from any species hitherto described. It requires the heat of the stove, and is readily increased by cuttings, which are exceedingly tenacious of life; a specimen, under pressure for the Herbarium, continuing to push a great shoot at the extremity two months after being gathered."

In the second volume, page 529 of the Royal Horticultural Society of Gardening in 1951, the name *C. crassifolia* is given, the country of its origin given with uncertainty as Mexico. Inasmuch as definite localities are known in Mexico from the States of Oaxaca and Chiapas, where plants pertaining to this species have been identified as *C. stenophylla*, it is probable that the original collection of *C. crassifolia* was obtained from either one of these States. Until the recent introduction of this plant by the present author, the species had not been known in cultivation in the United States, although it has been in cultivation at Kew under the name *C. crassifolia*. In the United States, it is being introduced into horticulture under the English name of "Mayan Fire Plant" (See *Bulletin Chicago Natural History Museum* Vol. 25, No. 4:7, April 1954 and No. 5:2, May 1954) in allusion to the fiery red corollas and the location of the plant where it occurs on the slopes of volcanoes in Guatemala in the land of the Maya.

It is fortunate that the correct name of this plant has been detected before the plant had become widely distributed in this country. It was only through accidental circumstances that Doctor Moore encountered the original plate and description of *C. crassifolia*, but his keen botanical observation enabled him to spot its identity with what had been passing as *C. stenophylla* and led to the re-establishment of the older name of *C. crassifolia*.

The present author can testify as to

the hardiness and adaptability of this plant in the house. Although it remains covered with large red flowers mainly during January, February, and March, especially in February, the plant produces flowers continually until June. One plant had some flowers for six months. In the axils of the leaves following the flowers appear glossy, pale lilac berries nearly an inch long. These present the appearance of colored beads attached to the stem from base to tip. These berries are full of tiny black seeds surrounded by the pale flesh. The coriaceous leaves indicate that the plant has something of the characteristics of a semisucculent type and withstands ordinary dry house conditions. As a matter of fact, the plants may be watered only once a week and thrive with a minimum of care.

Julian A. Steyermark, Curator of Herbarium, Chicago Natural History Museum, Chicago, Illinois.



A New Upright Carpinus caroliniana

Carpinus caroliniana f. *ascendens* was discovered by me in a woodland pasture southeast of Rochester, New York, in 1918. The plant shown in the accompanying photograph is a graft of the original plant on understock of the same species and is now twenty-six years old. It is located in Durand Eastman Park at Rochester, New York.

This new form has a height, at the present time, of seven meters and a spread of slightly more than four meters. The trunk, proper, is four decimeters high with fastigate branches which contribute to give the plant its total height.

The leaves are ovate-oblong, 6-10 cm. long; 3-4 cm. broad; long acuminate, rounded or broad cuneate, and frequently asymmetrical at the base.

The petioles and young wood are hairy, at least when young, pilose on the nerves beneath with axillary tufts of hair.

The fruiting catkins are slender, stalked, 6 cm. or less in length, seldom longer, with sharply acute bracts measuring 7 mm. across.

Although this form of *Carpinus caroliniana* has never been distributed and is, therefore, currently not available, its dense, upright form which supplements the fine foliage characteristics of the species recommends its use as a valuable addition to the list of small, well formed trees so urgently needed for the proper treatment of ornamental plantings on small properties and other situations where small, generally compact, upright trees are particularly desirable.

Bernard H. Slavin, Superintendent of Parks, Retired, Rochester, New York.

Acacia farnesiana

Although no evidence has been discovered as yet that anyone has had the temerity to attempt the cultivation of the acacias that make such a glory in California springs, mostly species of Australian origin, it seems curious that there are so few specimens of the native *Acacia farnesiana*, which crosses from Mexico into Texas and has gradually come into cultivation across Louisiana and elsewhere in the South.

The one specimen in our own garden came from seeds collected in Texas. It is now about five years old and is over ten feet high, with a short trunk and widely divergent branches all furnished with a warm red-brown bark that is pleasant in itself. The top is broad, perhaps almost as wide as the height, and the shade is nicely broken, due to the small pinnately-compound leaves.

The flowers line the branches abundantly, once the plant starts flowering. Usually, here, they begin to show in February and, in ordinary seasons, i.e., those in which there are no sudden alternations of heat and cold, last for a month. They appear as small golden balls, with a perfume that fills the whole garden with sweetness.

Our solitary plant of this species has not fruited until this year, when it has produced a number of the fat indehiscent pods that are said to be succulent inside, or pulpy. As these are still too green for picking, this cannot be proved as yet, nor do I find a reference as to number of seeds per pod that may be expected.

Flowering at the same season is the so-called Banana shrub, *Michelia fuscata*, and the two perfumes are not agreeable together.

It is possible that the reason the plant is not more common is the fact that it is the tap-rooted sort of plant that is a particular nuisance in regular nursery practice, since the seedlings

have to be handled with care and abandoned when once too large for safe transplanting.

B. Y. Morrison, Pass Christian, Mississippi.

Erythrina herbacea

To persons who have seen some of the magnificent tropical species of *Erythrina*, the thought that there is one species native to this country, and presumably cold hardy within limits, is a happy thought. In this part of the world, where it appears sparingly in gardens, it is a poor makeshift for the tropical species.

It is interesting, however, in that it blooms in late May and early June when there are few flowers with that particular hue of red. In most cases, the flowering shoots are slow to appear and often rise from the ground, as if there were no more plant to come. The flowering shoots are leafless here, grow about thirty inches tall, and produce at the tops the flowering spike which should be called a raceme. In our case, and in all cases seen, it is not "few flowered," but bears up to thirty blooms. It is true that not all mature fully, since it is just as much beloved by insects here as in the tropics. Seed rarely forms here and when it does is usually eaten while immature by some one of the Bruchid beetles.

In spite of all this rather lukewarm description, the species is a plant that can be used in dry locations in the garden, even in places where it will have to compete with other vegetation for whatever water there may be. The color is interesting, one of those slightly browned reds for which we have no "common" term. It is more brilliant than the hues that one associates with the word mahogany, if any one recalls what mahogany looks like in this age of bleached and fumed woods that no longer resemble in any way what they were when growing. The flowering



Lester Rowntree

Lotus mascaensis

season depends somewhat on the age of the clump, but two weeks is a safe maximum to consider in planning.

B. Y. Morrison, Pass Christian, Mississippi.

Lotus mascaensis

California nurseries carry two forms of this small rock shrub from Teneriffe. The more desirable one has leaves of silver gray while the other form has more green in the foliage. A well grown two year old plant may be over two feet across and eighteen inches tall in the center. In sun and plenty of air it is a prodigious bloomer, lifting clusters of yellow pea-shaped flowers just above the background of silver. Bloom begins in early spring and lasts until late autumn.

Even with the best of drainage and in the light soil which is its meat, *Lotus mascaensis* (hosackia according to some authorities) cannot be considered hardy. The plants should be renewed from cuttings every few years for in old age they show too much bare

woody growth at the base and too few of the lovely gray sprays composed of branchlets carrying tufts of narrow pinnate little leaves.

Wind is needed to shape the bush to low density and surely the little shrub must get plenty of breeze on its island home but when swirling winter storms come to this coastal hillside they delight in spinning a healthy plant around and around to the breaking point, flying north with it and dropping it among the Monterey pines. Perhaps, in its home, wind action is a thinning process.

Lester Rowntree, Carmel, California.

Dutch Iris, Provisional Notes

In this climate where the spring scene cannot be enlivened by tulips unless one resorts to the agonies of refrigeration, the same sort of element in garden design can be had from Dutch iris, with the same slender vertical stems, and terminal blooms that look well from all sides. The color range is different,

however, but not as limited as one might fear.

Since gardens in these parts boast only *Iris tingitana* in the form 'Wedgwood,' a dark lavender that looks like 'Imperator' and some nameless yellow, it was decided last autumn to buy a dozen of "every name" that could be located. As the orders were mostly placed late, the bulbs that came were sound but small, and generally yielded but one flower per stem instead of the familiar two.

'Wedgwood' blooms so far ahead of all the rest that it cannot enter into any color scheme with the rest. The other varieties covered about three weeks in flowering time and fell roughly into two groups.

'Ankara' is the most delightful of bronzes, warm and coppery, with only a hint of purple at the very base of the style branches. It needs careful placing in the garden to accent the colors—here with yellow pansies and white azaleas.

'Blue Harmony,' tall, bluest of the "blues," all of which are blue lavenders, extra fine form and substance.

'Blue Horizon,' tall, early, very bluish falls with a narrow lemon blotch on the falls, standards purplish lavender.

'Blue Triumphator,' much like the last but with standards a little more purple toned. Excellent.

'Bronze Beauty,' medium height, standards blue purple, falls greenish bronze.

'Bronze Queen,' much like the last, but the falls definitely more greenish. 'Lake of Thun' and white pansies for these two.

'Gold and Silver,' tall, midseason, stunning, falls yellow with wide orange blotch, standards white.

'Golden Emperor,' medium height, early, essentially lemon yellow with a narrow yellow line as blotch on falls.

'Golden Harvest,' much like the last

but one tone deeper in color. The standards are shorter than in many and give the flower a squat appearance.

'Golden Lion,' tall, midseason, this yellow tends toward orange more than in any of the earlier sorts. Excellent.

'Harmony,' is like a pale edition of 'Bronze Beauty,' that is, the standards are pale lavender, the falls yellow washed lightly with bronze.

'H. C. van Vleet,' much like 'Blue Horizon' but possibly a little darker.

'Huchtenberg,' the earliest of all, paler than 'Harmony,' with lemon yellow standards and bluish falls.

'Imperator,' tall midseason, much like 'H. C. van Vleet.'

'Mauve Queen,' really pale lilac in color with a narrow line of lemon yellow as the blotch on the falls. Charming in spite of the name.

'Panamint,' much like a giant 'Huchtenberg' but taller, later and a little paler.

'Princess Beatrix,' one golden yellow flower, the rest flowerless.

'White Excelsior,' medium height, pure white falls with a narrow yellow line as signal, the white standards possibly with a faint tone of yellow.

'White Superior,' taller than the last, otherwise similar except that there is a hint of pale lavender in the standards. These two were stunning in front of white azaleas with purple, red and wood-colored pansies at their feet.

'Yellow Queen,' golden yellow, with wide signal patch in falls, a little darker in color.

The group that came definitely later was a smaller number, but some were quite outstanding.

'Belle Jaune,' tall, deep yellow, with a broad orange yellow patch on falls.

'Stranger,' standards blue lavender, falls and style branches greenish bronze over blue, clear yellow signal blotch. Very nice in front of roses with bronze new foliage.

'Saxe Blue,' one of the nicest colors



Clint Bryant

The All-America Rose Selections has chosen Floribunda Rose 'Circus' for the 1956 All-America Award. It is a unique addition to the All-America family because of its ever-changing colors varying from rich yellow and red in the bud to orange-buff, flushed with appleblossom pink, and usually ending with a gay flourish of red as the flower fully opens.

of all, almost a self with only a little deeper color at the base of style branches, all a light blue lavender.

'Orange King,' tall, the deepest of all the yellows here, with a wide orange blotch on the falls; very nice indeed.

'King Mauve,' is almost exactly like 'Mauve Queen' but several tones deeper, and about eight days later.

'National Velvet,' is the most unusual color, a deep blue purple, the falls and style branches a little darker than the standards, the yellow patch on the falls narrow and very light in tone.

'Lemon Queen,' a medium height, very pale lemon yellow, the standards very pale and catching the light well. The signal on the falls is very light yel-

low and in effect merely intensifies the color of the falls.

'Princess Irene,' midseason really, but a larger edition of 'Gold and Silver' except that the gold of the falls is a little deeper.

If it were necessary to reduce the number of varieties, the easiest cuts to make would be among the blue purples and the yellows. If forced to choose a list, I should feel I wanted most 'Gold and Silver,' 'National Velvet,' 'Lemon Queen,' 'Bronze Queen,' 'Orange King,' 'Bronze Queen,' 'Ankara,' 'White Superior,' 'Belle Jaune.' Here is the hope that none of these disappear with mosaic or other ills.

B. Y. Morrison, Pass Christian, Mississippi.

Coleman's Native Azalea Trail

After I retired, twenty-eight years ago, I acquired a parcel of land consisting of forty-two acres of woodland with many spring heads and native plants on the southeast corner of what is now Camelliamere Farm, located two and one-half miles east of Fort Gaines, Georgia.

Since there were many native azaleas growing on the Trail, I began collecting different forms from other areas and transplanting them in such a manner as to preserve the natural plant materials and vistas, as well as to provide variation in color, time of bloom, shape and color of foliage, type of growth and flower, instead of pursuing my original plan to have representatives of all types and species of plant native to Georgia.

For example, the best show on the Trail in the spring is put on by *Azalea canescens* which varies from the early blooming plants from Florida to those from north Georgia which are late blooming; the color of the corolla tube of north Georgia plant, is darker than that of plants from east Georgia.

In addition to the azaleas, I have incorporated other specimens of plant material indigent to such a setting: hollies, magnolias, pinckneyas, anise, myrtles, leucothoe, pieris, and vaccinium. Dogwood, redbud, halesia, and amelanchier shade some of the areas where varieties of *Camellia japonica*, *C. sasanqua*, Indica and Kurume azaleas, *Kalmia latifolia*, *Rhododendron carolinianum*, *R. chapmani* and *R. maximum* flourish.

Among the early blooming plants you will occasionally find a white *A. canescens*, but seedlings from these plants apparently revert to the pink. A new plant, *A. "multiflora,"* blooms with the early *A. canescens*, and I have noticed that with each plant having red blossoms (luteum sub-series) there will be a plant having white or pink

blossoms. Other early blooming plants are a red form of *A. speciosa*, *A. rosea*, a northern species, *A. vaseyi*, a plant from the mountains of North Carolina, and *A. nudiflora*, from north Georgia, which has glabrous winter buds and flowers which generally are not so pretty as those of *A. canescens*. In addition, we have two species, *A. austrina* and *A. alabamense*, which are lovely and are native to the Trail. *Azalea alabamense* was first described to me, when I first began collecting my plants, as a low plant with small white flowers. I have since obtained alabamense—like plants that were eighteen feet in height, plants that have very nice flowers, certainly not commonly considered as small, some pure white, some white with various shades of pink, and some with the yellow upper lobe.

Many of the above group will extend the blooming season to overlap and bloom with *A. calendulacea*, such as *A. "colemanii,"* with its delightful fragrance and white blossoms, closely resembling *A. atlanticum*, which will grow to heights of ten feet or more. *Azalea alabamense* will overlap *A. calendulacea* in flowering. At the time the mid-season varieties of *A. calendulacea* flower, *A. viscosa*, *A. furbishi*, *A. viscosa* var. *montana*, and *A. arbore-scens* will also be blooming. Intermingling with this show, we see *A. bakeri* beginning to bloom, which carries us into the flowering period of *A. prunifolia* and *A. serrulata*.

During this entire period of bloom of our native azaleas, there are some natural hybrids to give many hours of speculation and enjoyment. Among this group we have a few that blooms as hose-in-hose, a few semi-doubles, and a few are doubles.

Azalea speciosa merits more publicity than is usually given. Plants on the Trail from the northern borders of their natural boundary usually give blossoms in different shades of red with

an orange blotch on the upper lobe, whereas blossoms from the southern range show much more variation as to color. In addition to the reds, there are pinks of many shades, oranges, and yellows. The northern type, as a rule, is last to flower, and I am confident that by selecting individual plants the flowering season could be extended in the same manner as for the southern series. As I see it, *A. "multiflora,"* and *A. fastigifolium* belong to this "series," but they are definitely different in many ways. I do not approve of a wide range of variations within a species, but there are some that are coming true from seed in the wild that I think merit a specific status. For example, a white, found growing in groups on Pine Mountain, I think, should be named by Mr. and Mrs. Cason Callaway as seemingly they were the first to bring it into cultivation. There are two of these plants growing on the Trail.

My friend, the late C. D. Beadle of the Biltmore Estate, in North Carolina, "dubbed" the Trail as "Coleman's Gold Mine," meaning a gold mine of botanical information. Mr. Beadle and I made several collecting tours, and he gave me much botanical information concerning the native azaleas.

The experiences encountered while obtaining plant materials from the countryside add to the enjoyment of adding to my collection. The method of digging the plants in order to leave root stock for future growth, and cutting back the plants before planting on the Trail, are important to maintain good relations with the donors as well as to insure a healthy plant which will provide enjoyment for many years to come. My son, Dan, Jr., and son-in-law, Frank Gilreath, are my invaluable assistants in collecting and planting my collection, and together we have made a beauty spot as well as a place of study.

List of the Species of Native Azaleas

- Azalea austrina*: Many shades of orange to yellow.
A. alabamense: White, white and pink, pink, white with pink border, white with yellow upper lobe, cream, and yellow.
A. arborescens: White, slightly pink, pink with yellow upper lobe.
A. atlanticum: White and pink.
A. bakerii: Various shades of yellow to flame and red.
A. canescens: Pink of various shades, also white.
A. cumberlandense: Red to various shades of yellow.
A. furbishii: Pink.
A. fastigifolia: Of the *A. speciosa* group.
A. nudiflora: Pink of many shades.
A. "multiflora": Red of the *A. speciosa* group.
A. oblongifolia: White.
A. viscosa var. *montana*: White and pink of the *A. viscosa* group.
A. prunifolia: Red of many shades, to almost yellow.
A. rosea: Pink.
A. serrulata: White, of the *A. viscosa* group.
A. "colemanii": White, of the *A. viscosa* group.
A. viscosa: White, *A. viscosa* group.
A. speciosa: Red, various shades of pink, yellow.
A. vaseyi: Pink of various shades of yellow.
A. calendulacea: Flame and many shades of yellow.

(There are many variations of some of the species and some natural hybrids.)
S. D. Coleman, S. D. Coleman Nurseries, Fort Gaines, Georgia.

The Use of Simple Outdoor Frames for Rooting of Summer Cuttings¹

Complaint is sometimes made of the perversity which makes cuttings of a great number of plants root best in early or mid-summer, when the care of the cuttings is most exacting. Many gardeners are deterred from utilizing this season because they interpret the terse direction of the garden manual "cuttings in June under glass" to signify a greenhouse as requisite to propagation. Actually many cuttings can be rooted as well or better in an ordinary cold frame than in a greenhouse in summer, and with less effort. For many years nurserymen have utilized cold frames extensively in summer propagation by cuttings.

In the cold frame, as in the greenhouse, success in rooting cuttings in summer depends on control of humidity and temperature. Adequate control of temperature at this season means principally avoidance of excessive heat, which is attainable by shading, and maintenance of high humidity, which can be secured with comparatively little watering through use of sash and shades. The general program is to seal the frames almost air tight and to disturb them only for watering; the tighter the seal and the denser the shade practicable, the less frequently is watering required.

This paper describes methods through which ordinary cold frames were used with considerable success at Glenn Dale, Maryland, a few miles from Washington, D. C. Since details of the equipment appear to be an important factor in results, and since certain features of the shading differ from conventional nursery practice, a complete description is warranted. Long frames, six feet wide, with poured concrete walls were used. These were covered with standard six-foot hot-bed sash. The soil level within the frame was even

with that outside. The rooting medium, either washed river sand or a mixture of 75 per cent sand and 25 per cent peat moss, was placed in the frame directly on the surface of the soil to a depth of about four inches. Frames of concrete, tile or brick have a certain advantage for summer propagation since the excellent insulation provides uniform conditions which are difficult to obtain with a board frame unless it is double-walled and filled with an insulating material or banked with soil. These frames sloped to the south, as do most frames used for plant growing. Some, however, have recommended that frames to be used exclusively for propagation should have the slope of the sash toward the north in order to obtain a more indirect light.

The amount of space between the glass of the sash and the rooting medium does not appear to be important. The cuttings root well even when practically touching the glass.

Shading the Frames

Frequently, propagating frames are set close together with service walks between, so that the whole area may be covered with extensive structures for shading, such as a framework covered with muslin or burlap, or lath shades. This type of shade has the advantage of leaving the glazed sash covering the frame easily and quickly movable at all times. However, when the cuttings, such as these, may be handled without excessive opening or closing of the sash, the simpler and less expensive expedient of laying the shade directly on the sash is fully as satisfactory.

Two types of slat shades were used for shading the outdoor propagating frames, both with and without bottom heat. Shades of this type were three feet by six feet with a board two and three-quarters inches wide on both the longer edges of the shades. Between these were twenty-two slats laid longi-

tudinally with an opening of approximately five-sixteenths between slats. Each slat was approximately one and one-eighth inches wide. When used over standard sash on the frames no additional shade was needed for the propagation of comparatively difficult cuttings and no difficulty was experienced in keeping the cuttings from wilting.

Much lighter shades of the same type of construction were also used. These had a piece one and three-quarters inches wide on the outer edges of the shade but had only fifteen slats, each approximately one and seven-sixteenths inches wide. There was an opening of three-fourths of an inch between slats. These shades did not reduce light enough to be safe for most cuttings and therefore were always used in combination with an additional shade made by stretching a loosely woven burlap over a light wooden frame. Both light measurements and observation of the behavior of the cuttings indicated that this double shade was the equivalent of the single heavier shade. Shading of the sash by painting the glass is not as desirable as a shade raised above the glass which allows a free circulation of air to take place between shade and glass. In windy exposed locations, the shades may be held in place by a wire stretched over the top of the frame or by weights.

Amount of Shade

The amount of light is a critical factor in all propagation by means of cuttings. Greenwood cuttings should have as much light as possible without injury, which is usually a vastly reduced amount. A major cause of failure in propagation is often an incorrect amount of light on the propagating bed. Damping-off results from excessive shade; but, on the other hand, the cuttings may be lost by excessive light for even a short period. The shading used

on these frames would be considered excessive by some propagators, but the results have justified the use of the amount specified here. The use of light measurements in propagation experiments is to be recommended highly, and probably some system of measuring light will be in common use in practical propagation eventually.

Light Intensity within Frames

In order to obtain an estimation of the reduction of light within the frames, readings were made with a Weston Illumination Meter. At Glenn Dale, the normal intensity of summer sun at noon on a clear day is around 10,000 foot candles. The light on the cutting medium at this time under an unshaded sash with clear glass was reduced to about half this intensity. Averages of numerous readings on the cutting medium showed that under the sash with the heavy wooden slat shades, the light intensity was only slightly over 300 foot candles.

Similar light measurements made in propagating cases in a north lean-to greenhouse at the same time were almost identical. Since excellent results in propagation were being obtained in the greenhouse under these conditions as well as in the frames, it seems safe to assume that these light conditions, if not precisely optimal, were at least adequate.

Bottom Heat

Frames which are used without bottom heat require no excavation. Such frames may be electrified by lead-covered soil heating cables with thermostatic control, which provide ideal rooting temperatures for cuttings of any sort desired. However, the expense of the equipment is a disadvantage and in some localities the cost of the electricity is excessive.

Cornstalks, hay, weeds or other decaying vegetable materials may be used

to provide bottom heat for cuttings, but a pit one or two feet deep is required and the heat does not last longer than is necessary for rooting a single lot of cuttings. Our records show that a layer of packed decomposing green rye straw a foot or more thick raised the daily mean temperature of the rooting medium about ten degrees Fahrenheit in midsummer and lasted over a period ample for the rooting of many cuttings with a gradual diminution toward the end of the rooting period.

Advisability of the use of bottom heat depends on two things: the climate of the locality and the time of the summer in which the cuttings are to be rooted. As one progresses northward, the tendency of propagators to use bottom heat in outdoor propagating frames generally increases, particularly in locations in which the nights are cool.

The decision to use bottom heat also depends to some degree upon the period during which the cuttings remain in the frames. The use of bottom heat is often unnecessary for propagation done in the early part of the summer in most of the United States. On the other hand, cuttings placed in frames in late July or August may not root well unless bottom heat is supplied, particularly in many locations north of the Mason and Dixon line. The nature of the plants to be propagated also must be considered in deciding the question of bottom heat. Thus, solar frames or other provisions for high temperatures are used in propagating certain tropical plants even in southern locations.

Some cuttings are benefited by bottom heat even though they form roots without it. Whether the expense and inconvenience of providing bottom heat is justified depends on certain factors which can be decided only on the basis of the experience of the individual propagator. Bottom heat benefits only those deciduous greenwood cuttings which are relatively active and are ex-

pected to root and grow on immediately. Cuttings of many sort of evergreens, such as hollies and yews, are commonly rooted by placing cuttings of well-ripened wood in frames without bottom heat in late summer or fall, and leaving them over the winter with adequate protection. Rooting is completed during the following spring. Bottom heat is usually undesirable for cuttings such as these which are in an inactive condition when first made.

Rooting Media

Any of the standard rooting media may be used with success in outdoor frames of this type. However, mixtures of peat moss and sand are particularly advantageous for many plants, especially the ericaceous species, and are to be recommended whenever possible, since they hold water especially well and thus reduce the frequency of opening the frames for watering. Peat mixtures can be overwatered easily. Both the imported and domestic moss peats, somewhat acid in reaction, are satisfactory; but sedge peats should not be used.

On hot, clear days, or when there is considerable wind, great care must be taken to prevent the wilting of the cuttings during handling or when the frames are open. If the cuttings must be inserted during the hottest part of the day, an effort should be made to keep the sash over as much of the opening as possible. A portable shade is sometimes placed over the frame while cuttings are being set. Cuttings should be inserted firmly in the rooting medium, but a heavy watering is quite sufficient to firm the medium about the bases of the cuttings without tamping.

Watering

The interior of the propagating frames was kept moist at all times. The effective insulation of the frame, however, due to construction, method of

TABLE 1

Temperatures (Fahrenheit) of Outside Air Temperature and of Rooting Medium in Frame

Date	Outside Air Temperature in Shade		Air Temperature within the Frame		Soil Temperature	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
July 4	84	64	90	68	74	72
July 5	77	70	81	68	73	70
July 6	86	62	91	65	72	69
July 7	90	69	94	72	72	69
July 8	92	73	98	76	73	69
July 9	89	71	93	74	73	69
July 10	91	68	95	68	74	70
July 11	79	58	84	60	76	71
July 12	87	55	91	56	77	72
July 13	91	63	94	66	75	71
July 14	89	69	92	72	75	71
July 15	85	54	84	57	77	72
July 16	80	60	83	52	75	69
Average	86	64	90	66	74	70

shading and also a burlap seal on the edges made only infrequent watering necessary, except in hot dry weather. Long strips of burlap 40 inches wide were folded twice and then laid over the top of the concrete wall, overlapping several inches on both sides. This burlap strip remains saturated with moisture, and provides an effective seal on the edges of the sash, preventing drafts and loss of moisture.

The peat and sand rooting medium required much less watering than the pure sand. An occasional sprinkling over the top of the sash and shades of the closed frames was useful in hot weather and helped to keep the burlap moist. The cuttings were watered several times a week if hot weather followed insertion. After several weeks the frames having a peat and sand medium could be left for five to ten days without attention. In fall and winter practically no watering was needed, although routine inspections were continued at intervals of several weeks.

Ventilation

No ventilation was given at any time during the period of rooting. After the cuttings were well rooted, a period varying in length depending on the nature of the plant, air was admitted to the frame in increasing amounts to harden off the cuttings. This was necessary only if the cuttings were to be carried over the winter in these frames, instead of being potted at this stage.

Condition within the Frames

The humidity of the atmosphere within the frames was high, causing frequent condensation of moisture on the glass, but because of the slope of the sash, the water ran downward to the edge of the frame.

Records with soil and air thermographs showed that the temperature of the air fluctuated considerably between day and night and also with changes in the weather conditions, but the temperature of the rooting medium remained relatively constant. The max-

imum and minimum temperatures of a frame covered with the single wooden slat shades as described previously are shown in Table I. These temperatures were recorded in early July and show that the rooting medium was maintained near 70° Fahrenheit, which is a satisfactory temperature for the rooting of cuttings of the majority of hardy plants.

Results Obtained

Among the cuttings of woody species which have been rooted in these frames without bottom heat are:

Buxus sempervirens L., *Celastrus orbiculata* Thumb., *Cotoneaster* sp., *Dipelta floribunda* Maxim., *Disanthus cericifolius* Maxim., *Ilex* sp., *Loropetalum chinense* Oliv., *Pyracantha coccinea* Roem., *Rhododendron* sp., *Stranvaesia Davidiana* Dene.

The few cuttings which have not rooted well were those having a densely pubescent foliage. Such plants are sensitive to excess moisture and should be handled in the greenhouse. Often,

however, the frame has been superior in comparison with a greenhouse propagating bench. For instance, cuttings of *Dipelta floribunda*, which have never rooted well in the greenhouse in summer, were rooted with virtually no losses in these outdoor frames. Superior results were produced with much less attention than would be required for similar cuttings in the greenhouse.

Vernon T. Stoutemyer

¹Reprinted from the April 1941 issue of THE NATIONAL HORTICULTURAL MAGAZINE at the request of many of the Society's members. The reader may also be interested in an article on the propagation of softwood cuttings, under a constant mist of fine water being applied at all times throughout the day, which appeared in the January 1954 issue of this Magazine devoted to vegetative propagation. This issue has been reprinted and is now available to new 1955 members at \$1.00 a copy, postpaid.

ED.



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American Begonia Society, San Francisco Branch
American Begonia Society, Santa Barbara Branch
American Camellia Society
American Gesneria Society
American Gloxinia Society
American Iris Society
American Peony Society
American Rhododendron Society, Middle Atlantic Chapter
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